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COOLSCAN V ED

REPAIR MANUAL

Nikon | NIKON CORPORATION
Tokyo, Japan

Recycled paper

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Specifications

・Adapter, holder

(Standard accessory)

Slide mount adapter : MA-21

Strip film adapter : SA-21

(Option)

APS film adapter : IA-20(S)

Strip film holder : FH-3 (Insert into MA-21 for use)

Medical holder : FH-G1 (Insert into MA-21 for use)

APS strip film holder : FH-A1 (Insert MA-21 for use)

SA-20, SA-30 and SF-210 are not available (out-of-support adapter).

MA-20/MA-20(S) are operationally compatible with MA-21.

However, it is impossible to insert MA-21 to LS-2000/30.

IA-20 is operationally compatible with IA-20(S).

It is possible to insert FH-1 and FH-2 to MA-21, (but image processing is different).

・Appropriate film

35-mm film (Color / monochrome / positive / negative)

Slide mount (1.0-mm - 3.2-mm in thickness; 49-mm - 50.8-mm in width)

Strip film (up to 6 frames)

APS cartridge film

Glass microscope slides (26-mm × 76-mm; 0.8mm - 1.5-mm in thickness)

・How to insert

Slide mount	: Insert into MA-21
35-mm strip 1 - 6 frames	: With FH-3, insert into MA-21
35-mm strip (2-6 frames)	: Insert into SA-21
APS cartridge	: Insert into IA-20(S)
APS strip film	: With FH-A1, insert into MA-21
Glass microscope slides	: With FH-G1, insert into MA-21

・Scanning

Film-fixed, optical CCD-mobile single-pass scan

・Color separation

Perform by CCD monochrome sensor and RGB- LED

・Light source

IRGB － LED (4 colors)

・Projector lens

7 asymmetrical glass lenses in 4 groups （using ED glass）

Magnification : － 1.254

Focal distance : 46.19mm（ｅ -line）

OWD : 169.05mm

Aperture ratio : 1：7.44（effective value）

・Sensor

1 line × 3964 pixels, 8μm pixels, black-and-white linear CCD

・Maximum (optical) resolution

4000dpi

・Scanning range / No. of scanning pixels （convert at 6.377μm to 1 pixel）

MA-21	:	25.1mm×36.8mm /	3946×5782	pixels
SA-21	:	25.1mm×38.0mm /	3946×5959	pixels
IA-20(S)	:	18.6mm×28.4mm /	2916×4453	pixels

・Aperture size

MA-21	:	Aperture of slide mount
SA-21	:	23.4mm×36.0mm
IA-20(S)	:	16.1mm×27.4mm
FH-3	:	24.0mm×36.0mm
FH-G1	:	23.5mm×36.7mm

・A/D conversion

14 bits

・Output data

Full-color / monochrome 8 / 16 bits

・Output resolution

90 dpi - 4000 dpi for both main- / sub-scanning directions

・Focus

Autofocus ：Contrast detection system using CCD

・Scanning time （TYP value）

35-mm film, standard film, maximum resolution: 14/8 bits

PC: Pentium4 3.06GHz　RAM DDR SDRAM 1GB　Windows2000 Professional;　when CMS is ON

unit [s]

	ICE4/Scan image enhancer	TYP value
35-mm Posi	All: OFF	40
	ICE ON	72
	ROC ON	52
	GEM ON	105
	Revelation ON	97
	Scan image enhancer: ON	40
	All: ON	200
35-mm Nega	All: OFF	48
	ICE ON	83
	ROC ON	63
	GEM ON	112
	Revelation ON	109
	Scan image enhancer: ON	48
	All: ON	206
APS Posi	All: OFF	30
APS Nega	All: OFF	38

8-bits （Note：Scanning time by USB1.1）

	ICE4/ Scan image enhancer	TYP value
35-mm Posi	All: OFF	78

14-bits

	ICE4/ Scan image enhancer	TYP value
35-mm Posi	All: OFF	142

・Interface

USB2.0 (Hi-Speed USB)-based

Data transfer speed：Max. 480Mb/s

・Power-supply

Voltage: AC100 － 240V　　Electrical current consumption 0.3 － 0.2A or under

Frequency: 50/60Hz

・Operating environment (temperature / humidity)

＋10 － ＋35℃、20 － 60％ RH (non condensing)

・Size and weight

96 (W) × 172 (H) × 315 (D) mm

Approx. 3 kg（body only）

・Orientation

Horizontal or vertical

Mechanism

1. Hardware

1.1 Body unit

In appearance, the case consists of colored-steel top cover and under-panel, steel plate rear panel, and plastic front panel. Rubber foot is fixed in place on the top cover.

The front panel has the status-indicated LED unit, power switch, and adapter slot.
The rear panel has USB2.0-based interface connector and AC inlets.
Inside the body, a steel-made chassis is framed covering the mechanical unit, main PCB, and power-supply unit.

1.2 Mechanical unit

The optical scanning system is provided, which consists of illumination optics, projection optics, and CCD unit. To perform AF, the AF motor (stepping motor) drives the cam, via the reduction gear, and the mechanical block unit makes up-and-down (near-vertical) movements against the film. To perform sub-scanning, by combining the scan motor (stepping motor) and the lead screw, the mechanical block unit makes right-and-left (near-horizontal) movements against the film.

1.3 Main PCB (MAIN printed circuit board unit)

The main PC can be divided into MCU unit, custom IC unit, IF (Interface) unit, analog signal processing unit, illumination LED driving unit, and motor driving unit, according to function.

・MCU unit:
This consists of 16-bit MCU, SS-assembly (Flash memory), 128 KB × 8-bit SRAM × 1, and RESET IC, etc, and controls entire system (including adapters).

・Custom IC unit:

This performs at 100MHz of the maximum operating frequency. Main functions are image data scanning, illumination LED lighting-control, DMA control with the host interface, control signal generation, etc of the CCD and A/D, etc. This also controls input/output with other peripheral circuitry.
As coefficient memory and line buffer, 32 KB × 8-bit SRAM × 2 and 128 KB ×8-bit SRAM × 2 are connected externally.

・IF unit:

This consists of USB 2.0 controller and USB 2.0 connector.

・Analog signal processing unit:

CCD signal is processed by analog 1 chip IC, which consists of CDS circuit, gain circuit, black level adjustment circuit, and A/D conversion, then is output to the custom IC.
Gain circuit: 2-level switch
Black level adjustment circuit: The black-level electric potential is adjusted by 8-bit D/A.
A/D conversion circuit: Resolution 14 bits; conversion frequency: 2.778 MHz

・Illumination LED driving unit:
This consists of the transistor array, regulators, and resistors, etc. Turning ON/OFF of the transistor controls LED lighting of R, G, B, and I.

・Motor unit:
This is equipped with 2 motor driving circuits for the body, and 2 motor driving circuits for the adapters.
Body unit stepping motor × 2 circuits
Adapter stepping motor × 1 circuit
5V-series DC motor × 1 circuit

1.4 CCD-PCB (CCD unit)

This consists of PCB, CCD, CCD installing-plate, and CCD insulating sheet.
The scanner uses CCD with 3964 effective pixels in the form of the monochrome linear sensor.
The output signals from CCD are, via the emitter follower (buffer), output to the main PCB. The CCD-PCB is connected to the main PCB by the CCD-FPC.

1.5 Power-supply unit

This uses plastic boards, and includes the power-supply circuit, AC inlets, and power-supply switch.
While the input voltage ranges from AC85 to 264V, the output voltage is 5V, -12.2V, and +15.5V.

1.6 Connect adapter and feeder to the body

・Mechanical connections
The adapter rails are engaged in the grooves of the AD installing plate on the body side. The adapter is pushed from above to the AD-installing plate by the spring. When the adapter is inserted, the convexity part of the spring enters in the concavity part of the adapter.

・Electric connections
Via connector connection. The connection can be made when the power of the body is ON (hot plug supported）.
But MA-21 has no connector, so cannot be connected electrically.

・Connection identification
Via the detection switch.
Whether connected or not depends on signals of the connection-connectors. (The adapter has a circuit checking signals and identifies connections; MA-21 has no circuit.)
In case out-of-support adapter (SA-20) is inserted, errors blink on the LED.

2 Specifications by function

2.1 Adjust light exposure

The light exposure is adjusted by changing the exposure time and gain.

・Exposure time: controlled by the blinking time of the LED. The blinking time is controlled by the MCU's setting of the count value for the custom IC timer.

・Gain The controllable gain by the analog hardware has 2 levels: 1.00-fold and 2.00-fold of magnification (typ).

In case the exposure time is 64 times or under as long as the white balancing time, only the exposure time is increased/decreased.
In case the above time exceeds 64 times, the gain is switched to 2.00-fold of magnification.
But regarding "I-ch", the gain is always switched to 2.00-fold of magnification when scanning.

2.2 Dark voltage correction

The dark signal voltage (VDRK) is corrected by adding offset to the CCD signal, using D/A.

The dark signal non-uniformity (DSNU) is corrected digitally per pixel by the custom IC.
Whenever the driver software gives instructions, or the scanner is initialized, or commands are operated for CCD's scanning, the correction coefficient is measured.
The dark voltage corrections are made for each color and line.

2.3 Shading correction

The illumination irregularity and the CCD non-uniform sensitivity is corrected digitally per pixel by 16-bit correction coefficient of each color.
The correctable irregularity/non-uniformity is 49.98% or under.
In case the irregularity/non-uniformity before the correction exceeds 49.98%, errors occur.
The correct coefficient, of which characteristic is reverse against the uncorrected shading input, is calculated.
Whenever the driver software gives instruction or the scanner is initialized or the adapter is replaced, the correction coefficient is measured.

2.4 White balance

With the shading corrected, the exposure time is adjusted so that the average value of each color (R, G, B, and I) falls in the range of 90% of the full-scale value.
Whenever the driver software gives instructions or the scanner is initialized or the film is pulled out or the adapter is replaced, the correction coefficient is measured.

2.5 Averaging

The averaging in the main scanning direction is possible by the custom IC in the scanner.

Scanning pitch 1, 2:2 pixel average
pitch 3 :4 pixel average (No odd-number pitch for [S0010])
pitch 4 - :8 pixel average

The averaging is used when pre-scanning, or thumbnail-scanning by IA-20(S) and SA-21, or main scanning with pitch 2 (for resizing process).

2.6 Prescan

With Pitch 14 (corresponding to 286dpi) and Averaging being ON (8-pixel average in the main scanning direction), total range of film is scanned and the host computer analyzes, etc histogram (pixel distribution per brightness) targeting the following data.

MA-21	:	Posi: 25.1mm×36.8mm	Nega: 18.7mm×29.0mm
FH-3 (with MA-21)	:	Posi: 25.1mm×35.1mm	Nega: 18.7mm×29.0mm
SA-21	:	Posi: 25.1mm×34.5mm	Nega: 18.7mm×29.0mm
IA-20(S)	:	Posi: 18.6mm×28.4mm	Nega: 13.4mm×22.3mm

In case the maximum value is less than one half of the full-scale value, prescan should be performed again by changing the exposure time so that the value falls in this range.

(Host processing)
Based on the result of pre-scanning, conditions for exposure are set for final-scan.
Regarding nega-films processing, histogram is created per color based on the prescan image, and the max. and min. values of each color are calculated.
According to these values, min. and max. light exposure for each color are calculated, referring to specified nega-characteristic performance curve. By adjusting so that the max. value of the max. exposure for each RGB color become 16383, LUT is created based on the characteristic curve, which describs the max. value of the max. exposure and min. value of the min. exposure of each color.
Regarding posi-films processing, the color is decided of the max. value of pixels among RGB, and the exposure time of RGB is multiplied by uniform scaling factor so that the max. value of the color becomes 16383.

2.7 Nega-film base scanning

When SA-21 or FH-3 (with MA21) or IA-20(S) are used for nega-films, the base part of films (between frames, etc) is scanned to get the information on density of films. This density information is used for image output of nega-films.

2.8 Preview

The digital compensation is made based on the presan data, and preview image is created to displayed. (Host processing)
After the 2nd preview, the image is got by adjusting exposure and performing rescan.

2.9 Final scan

The final scan is performed in the designated scanning range and under the scanning conditions. LED lights up per 1 line; the CCD is driven and the data is written in the buffer; data is transmitted to PC; the scan block unit is moved. The image data transmission is made in parallel with other processing. The movement of the scan block unit is made while each LED for R, G, B, and I is NOT lighting.

2. 10 Ir-leak correction

To reduce effects by infrared ray leak (Ir leak), which is included in R-LED, the driver processes the correction. When products are deilvered from factory, Ir-pass filter is scanned for inspection and the correction amount is calculated to be written in the flash memory on the PCB. The driver software reads the amount and reflect on LUT for correction when image is output. The correction values are: Leak_g for general films, Leak_s for special films, and Leak_k for Kodachrome.

2. 11 Image output (Host processing)

Posi-films : The scan data from the body (scanner) is posi-linear output, and the driver manipulates an image such as γ-compensation. However, only about Kodachrome, the driver designates the film type.

Nega-films : Based on the results of prescan and base density measurement, LUT for nega/posi conversion is created. This creation of LUT is made by the driver software, and the body (scanner) does not make nega/posi conversion. The processes, such as γ-compensation, CMS-compensation, tone curve compensation, color balance compensation, LCH compensation, and unsharp masking compensation, are performed by the driver software.

Scan image enhancer: “Scan image enhancer” is included in the driver software to enhance images through one-touch operation, and reduce the burden on users' adjustments.

2. 12 Analog gain

By driver designation, it is possible to increase/decrease the exposure time.
Master volume: -2 ～ +2EV Each color: -2 ～ +2EV (Total maximum range: -4EV ～ +4EV)

2.13 ICE4 Advanced (Digital-ICE quad Advanced) （Host processing）

"ICE4 Advanced" is generic name of Digital-ICE, Digital-ROC, Digital-GEM, and Revelation.

・Digital-ICE : Detect defects (such as damages, dusts, dirt, etc), and restore the image data that was deteriorated by these defects. Scanning is performed by visible light of RGB and infrared light, then by getting the information on defects from the infrared images, RGB image is restored based on such information. This is available for Kodachrome but depending on images, slight blurs occur in some cases.

・Digital-ROC : Correct the color deterioration of films and color seepage

・Digital-GEM : Control and smooth graininess of films.

・Revelation : Change contrast per area, and optimize the dynamic range to get close to physical appearance.
This is used to describe the details under the following conditions: against light; insufficient light volume of speedlight; overexposure

2.14 Resolution and resizing process

Maximum (optical) resolution : 4000dpi

The body (scanner) can perform pixel-skipping scanning in both main and sub scanning directions.

Pixel skipping Pitch: 1 ～ 1/44 （corresponding to 4000dpi ～ 90dpi）

However, the scanner does not perform pixel skipping regarding odd-number Pitch except the full Pitch.

The final scan is performed with relatively higher resolution than the resolution of the final output image, and the driver software processes the averaging.

Final resolution	Scanning Pitch
4000 ≧ , ＞ 2000dpi	1
2000 ≧ , ＞ 1000dpi	1
1000 ≧ , ＞ 500dpi	2 （AVON）
500 ≧ , ＞ 250dpi	2
250 ≧ , ＞ 125dpi	4
125 ≧ , ≧ 90dpi	8

2.15 Thumbnail scan

・SA-21, SA-30

The body (scanner) fixes the scan block unit, and the inner motor of SA feeds films to scan images.

Resolution: 97dpi (Pitch 41）

Averaging: ON (8-pixel average in the main scanning direction)

AF position: is set when outputting thumbnail or set to the latest AF address in the past (192 address when AF is not performed)

Thumbnail can be automatically performed by detecting the insertion of films.

・IA-20(S)

The inner motor of IA advances frames, and the image is obtained through scanning by the body (scanner). The scanner scans with the mechanical block unit moving backward and forward, but as for frames that were scanned only with its moving forward, the reversal process is performed by the driver software.

Resolution: 90dpi (Pitch 44)
Averaging: ON（8-pixel average in the main scanning direction)
AF position: is set when outputting thumbnail or set to the latest AF address in the past (224 address when AF is not performed)

Thumbnail can be automatically performed by detecting the insertion of films.

2.16 AF

The scanning range is 3.75-mm in total (set value), covering 2-mm downwards and 1.75mm upwards from the alignment reference position.
When the AF scan is performed, the maximum position of contrast is calculated at a designated point. Then, comparing with data near the designated point, the maximum position is decided.
If the contrast cannot be calculated, it is retried by changing the illumination LED of AF.
The illumination LED of AF should be No.1:B / No. 2:I / No. 3:G or R.

To prevent wrong focus on borderlines of images, it should be confirmed that the max. and min. values of contrast meet the following condition:
（Max. value － Min. value） ＜ 1920（14 bits）
If the above condition is not met or the contrast cannot be calculated, it is retried by moving the CCD in sub-scanning direction.

In case of AF manual, the position can be selected arbitrarily. (default: center of frame of films)

2. 17 Default focus address

When performing the main scan without AF, the focus address should be the latest address in the past.
After initialization/replacement of adapter, if the scan is performed without even one AF, the focus address should be the fixed value of each adapter（including thumbnail scan of SA and IA.）

MA-21：132　MA-21+FH-3：197　MA-21+FH-G1：150　MA-21+FH-A1：153
SA-21：192　IA-20(S)：224

The focus address, when WB or SD is measured, should be the fixed value of each adapter.

MA-21：186　SA-21：323　IA-20(S)：323

2. 18 Detection of insertion/removal of films in use of MA-21

The CCD detects the insertion/removal of films in/from MA-21.
The CCD signal is checked by G-LED once per 1 second.

2.19 Identification of holder in use of MA-21

FH-3 and FH-G1 have small holes for identifying holder type. The CCD checks them and identifies the types of holder (and the direction of insertion in case of FH-3).

2.20 Detection of light reduction

When products are delivered from factory, the white balance (WB) time is recorded in the flash memory. Then when WB is measured, the change in light volume, comparing with the time at the delivery, is checked. If the light volume decreases by 40% or more, it is detected as an error: "When WB is measured, light volume decrease by more than a certain ratio than that at the time of product delivery".

2.21 Scanning position Y-compensation

By recording compensation amount in the flash memory, the scanning position in the sub-scanning direction can be corrected. The correctable range is ±0.6mm, and the compensation amount is calculated and recorded based on the chart when inspected.
Only even number can be designated for the compensation amount (i.e. number of lines).

2.22 SA lock mechanism

SA-21 has the mechanism of mechanical lock, in order to prohibit the removal of the adapter from the body (scanner) with films being inserted. If films are inserted, the locking plate is protruded from the adapter, and it engages with holes of the body (scanner).

2.23 Transport lock

When the scanner is transported, the security against shocks or jolts is ensured by setting the scanning mechanism and AF mechanism to the transport locking. The methods to enable the transport lock are as follows:
"Remove the adapter with the power being ON."
"Turn the power ON without inserting the adapter and perform initialization, then turn the power OFF."
"Via designation by the driver software."

2.24 Firmware download

The firmware can be updated by the host computer.
Via Write Buffer; "Initialize" followed by "Set Parameter" then "Execute" command

2.25 3-state display

The following 3 state can be displayed by LED indications.

Power ON/standby	:	Lighting
BUSY	:	Slow blinking
ERROR	:	Quick blinking

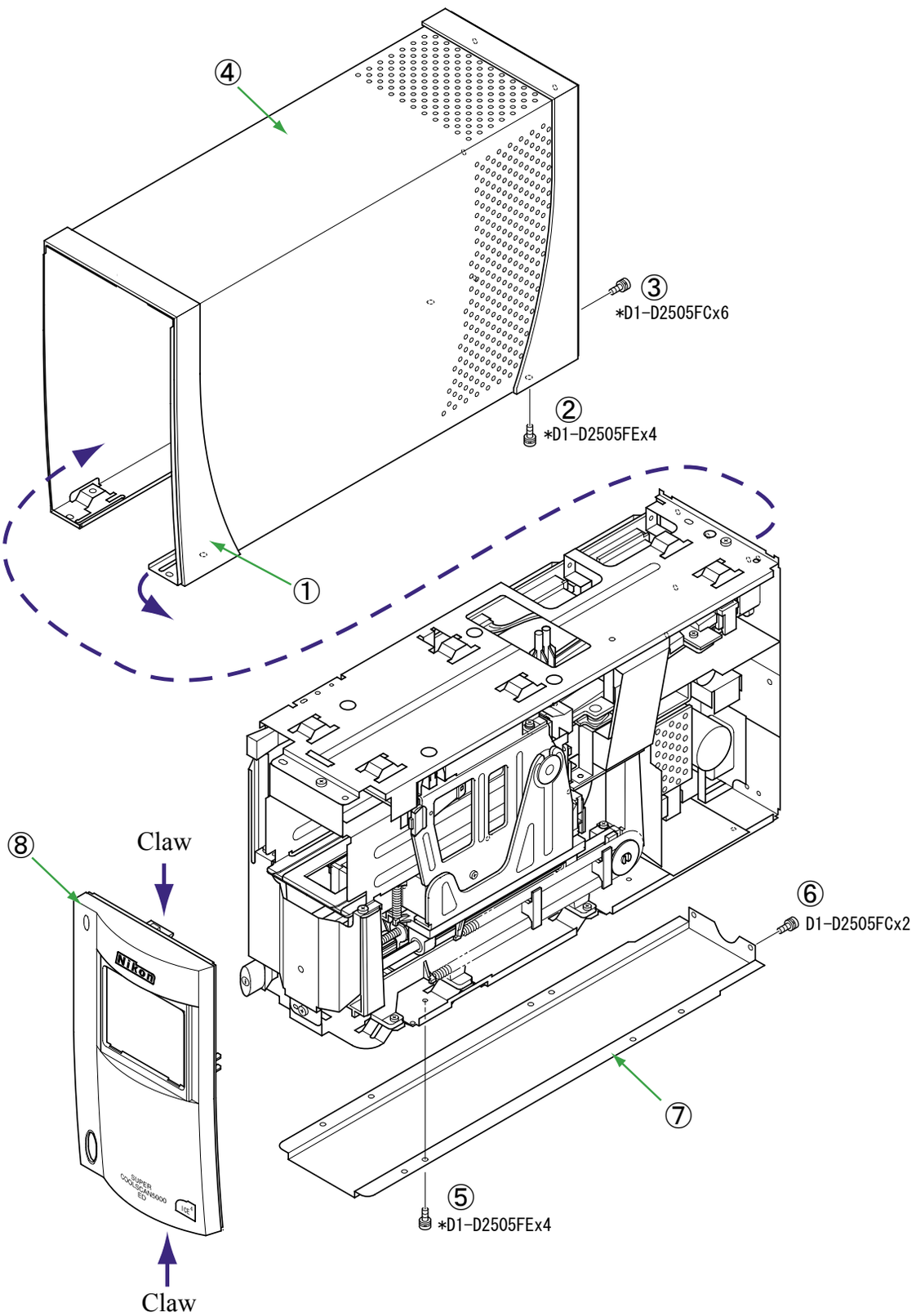
2.26 USB2.0 IF

The scanner static data including the adapter data is transmitted to the host computer by "Inquiry" command, while the dynamic data including all error information is transmitted from the sense data.

Disassembly

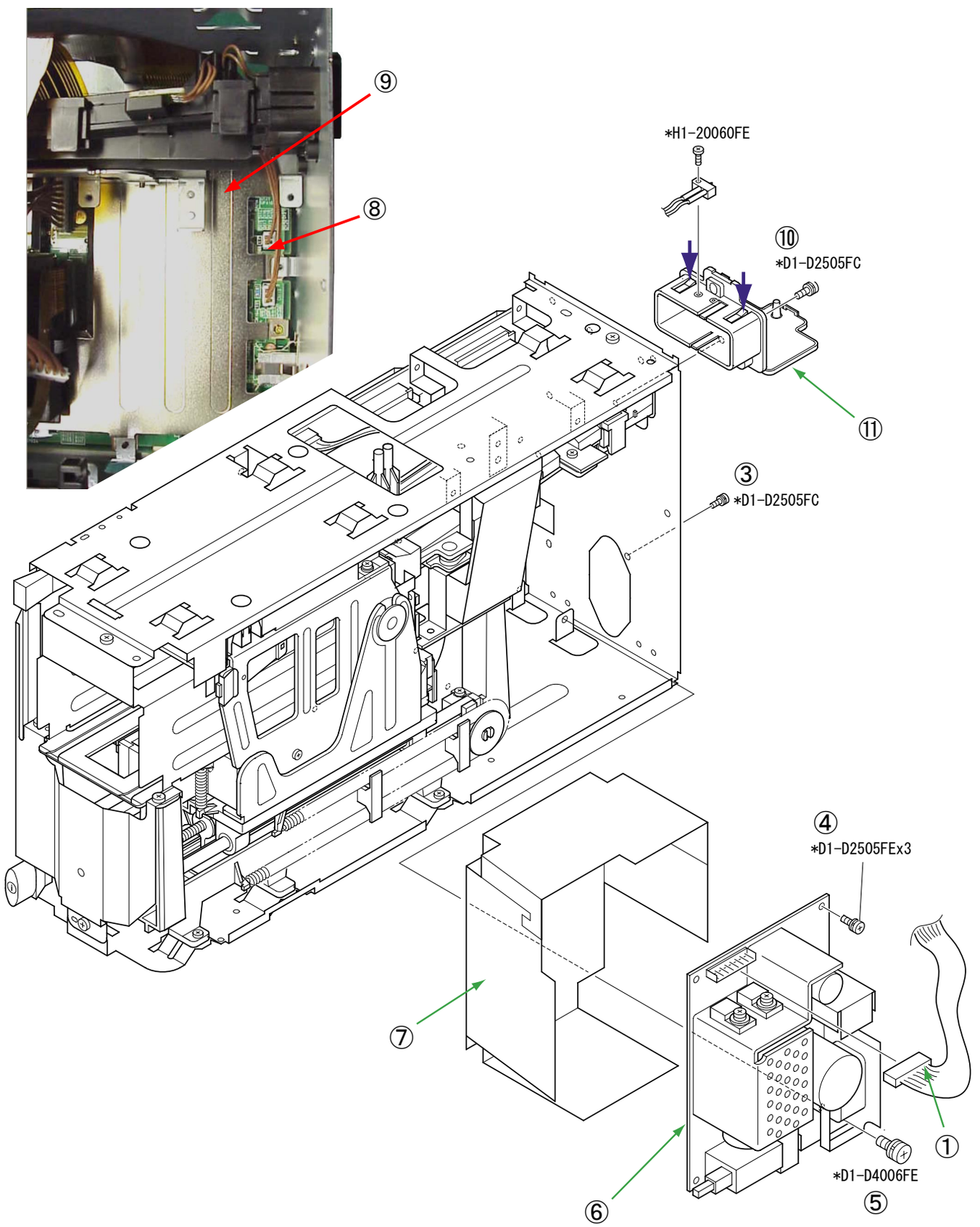
1. External view

- Peel off the rubber foot (①) in the direction indicated by the arrow, then take out 4 screws (②).
- Take out 6 screws (③).
- Pull the top cover (④) backwards to remove it from the body unit.
- Take out 4 screws (⑤) and 2 screws (⑥) to remove the under-panel (⑦).
- Unhook the 2 upper and lower claws of the front panel (⑧) to remove it from the body unit.



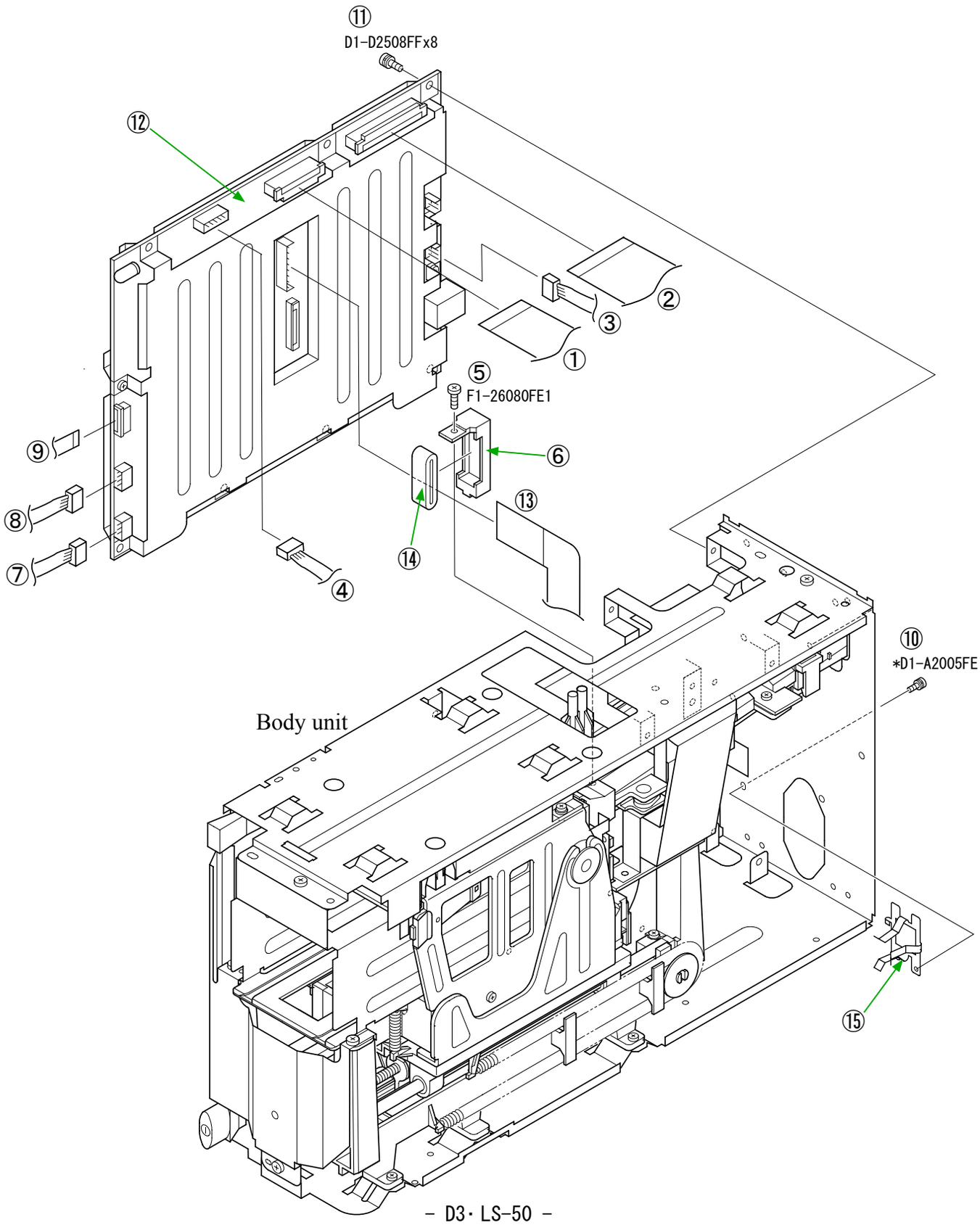
2. Power-supply unit, Film gate assembly

・Remove the power-supply harness (①) from the power-supply unit (②).
・Take out 1 screw (③), 3 screws (④), and 1 screw (⑤), to remove the power-supply unit (②).
・Remove the PS insulating plate (⑥).
・Remove the harness of the lid-release SW (⑦) from the main PCB (⑧).
・Take out the screw (⑨), then remove the film gate assembly (⑩) while pressing it in the direction of (↓).



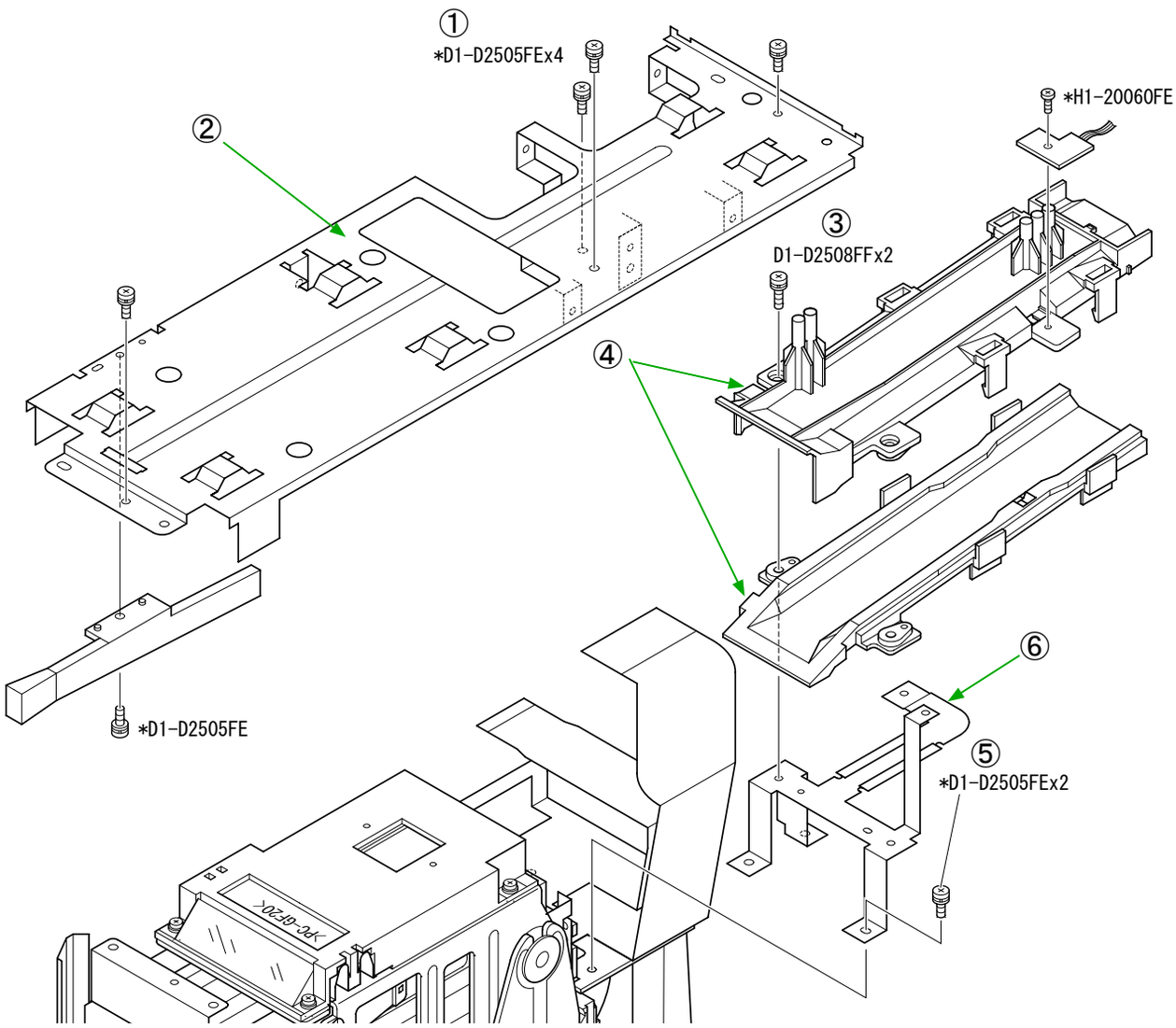
3. Main PCB

・Remove the AD-FPCs (① and ②).
・Remove the harness of the rail perforation sensor (③) and the LED harness (④).
・Take out the screw (⑤) to remove the core holder (⑥).
・Remove the harness of photo interrupter (⑦), the harness of scan motor (⑧), and the AF motor FPC (⑨).
・Take out 1 screw (⑩) and 8 sccrews (⑪).
・Open the main PCB (⑫) slightly, and remove the CCD-FPC (⑬) and the ferrite core (⑭).
・Remove the connector shield (⑮).



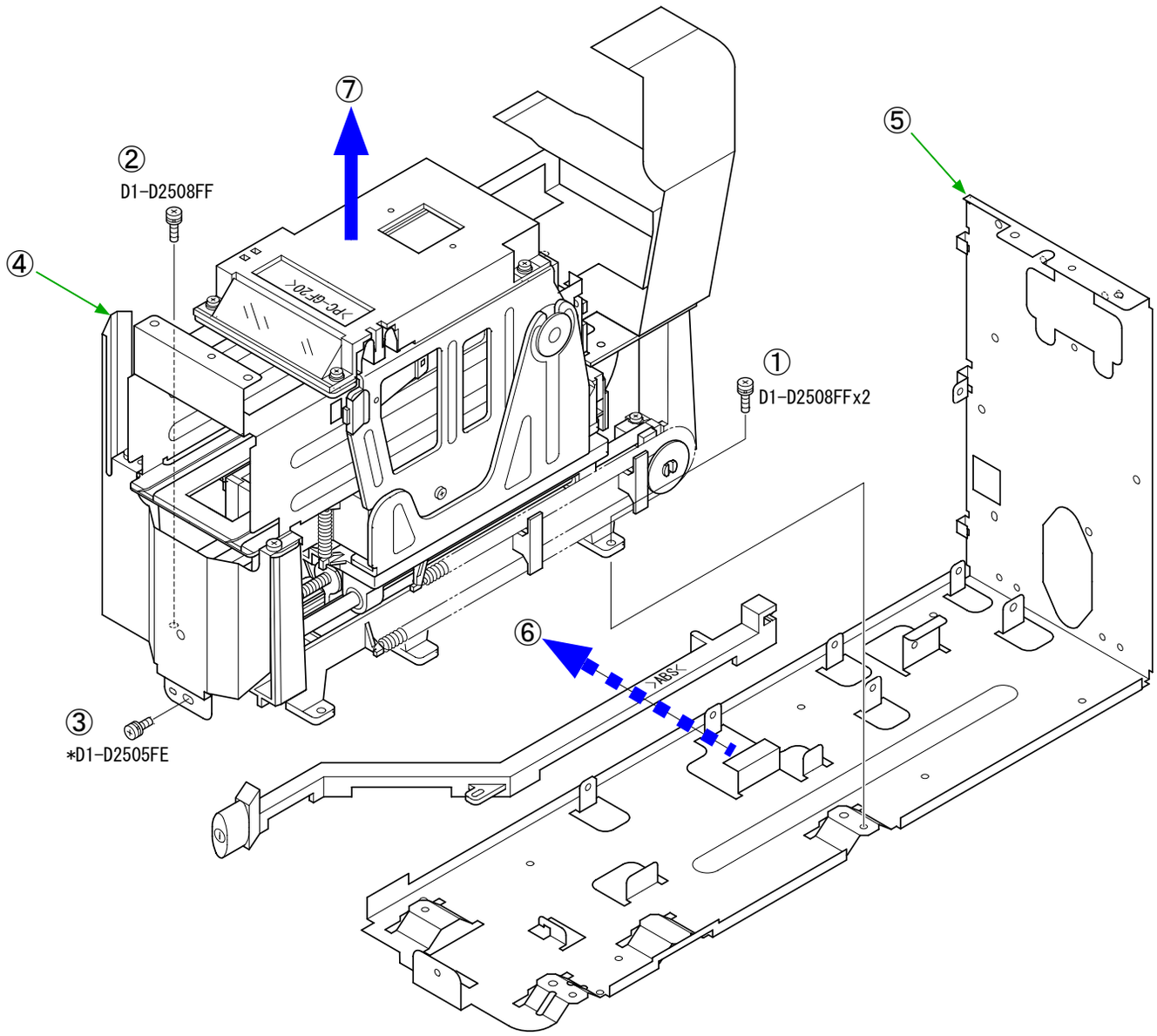
4. Top chassis, Film rail unit

・Take out 4 screws (①) to remove the top chassis (②).
・Take out 2 screws (③) to remove the film rails (④).
・Take out 2 screws (⑤) to remove the film rail plate (⑥).



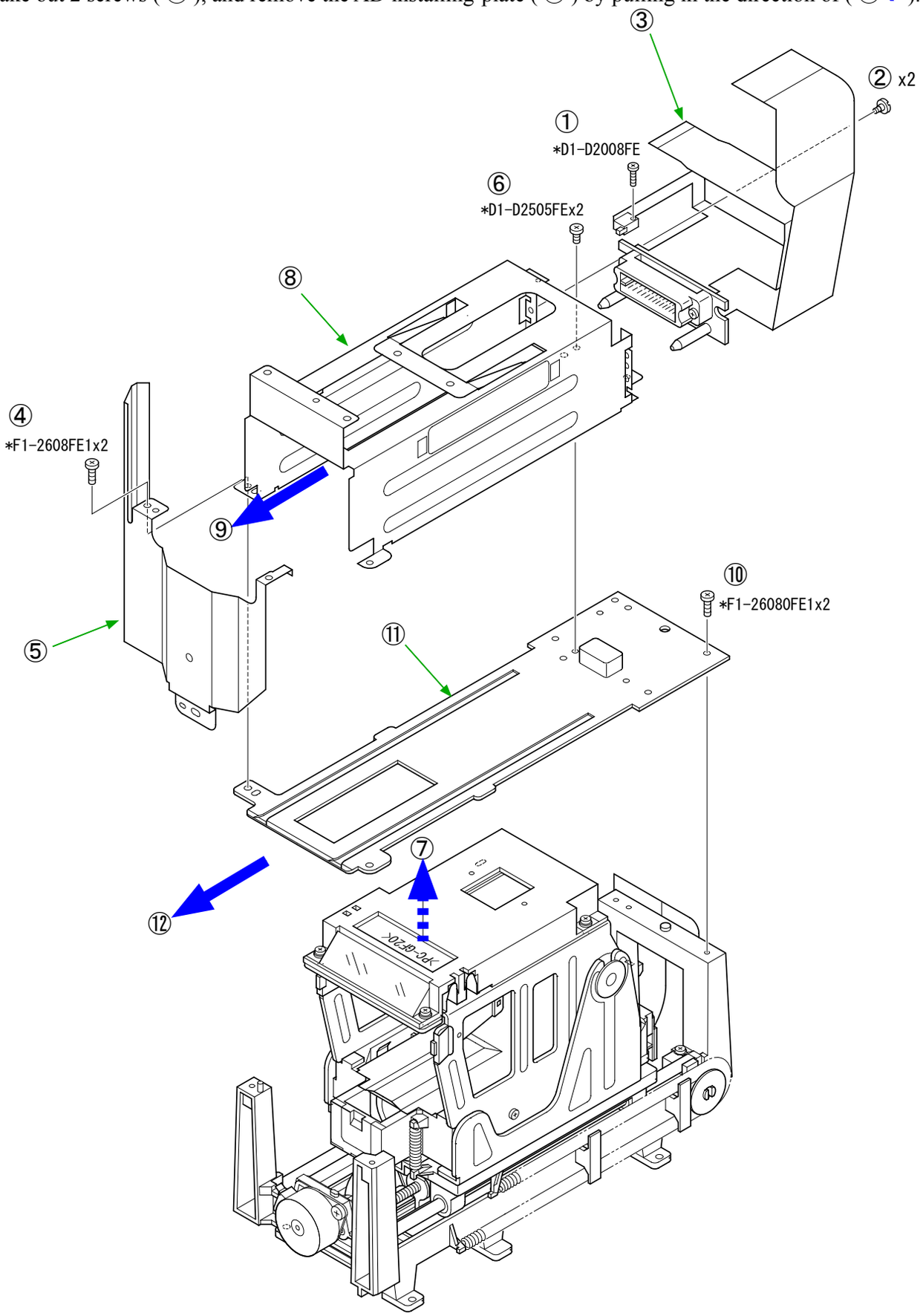
5. Main chassis unit

・Take out 2 screws (①) and 1 screw (②) and 1 screw (③).
・Displace the mechanical block unit (④) from the main chassis (⑤) in the direction of (⑥ ←), and remove it by lifting in the direction of (⑦ ↑).



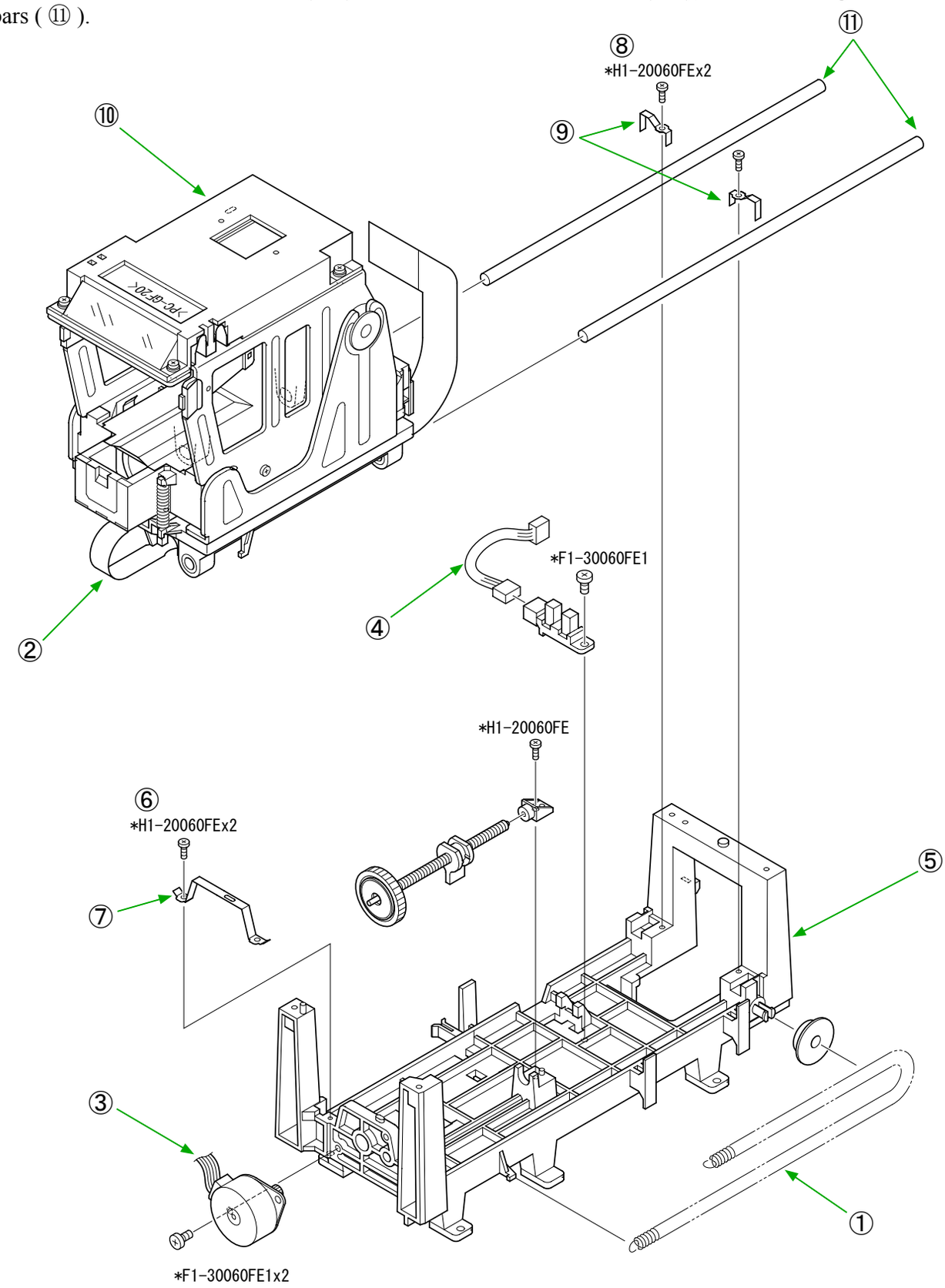
6. AD-FPC, AD retaining plate, AD installing-plate unit

・Take out 1 screw (①) and 2 screws (②) to remove the AD-FPC (③).
・Take out 1 screw (④) to remove the front shield plate (⑤).
・Take out 2 screws (⑥), then while lifting the AD installing-plate (⑧) in the direction of (⑦ ↑), remove it by pulling in the direction of (⑨ ←).
・Take out 2 screws (⑩), and remove the AD installing-plate (⑪) by pulling in the direction of (⑫ ←).



7. Mechanical base unit

- Remove the scanning spring (①).
- Unhook the AF-FPC (②), the scan motor harness (③), and photo interrupter harness (④) from the hooks on the backside of the mechanical base unit (⑤).
- Take out 2 screws (⑥) to remove the guide bar retaining-plate (⑦).
- Take out 2 screws (⑧) to remove 2 guide bar retaining-plates (⑨).
- Detach the mechanical block unit (⑩) from the mechanical base unit (⑤), and remove 2 guide bars (⑪).

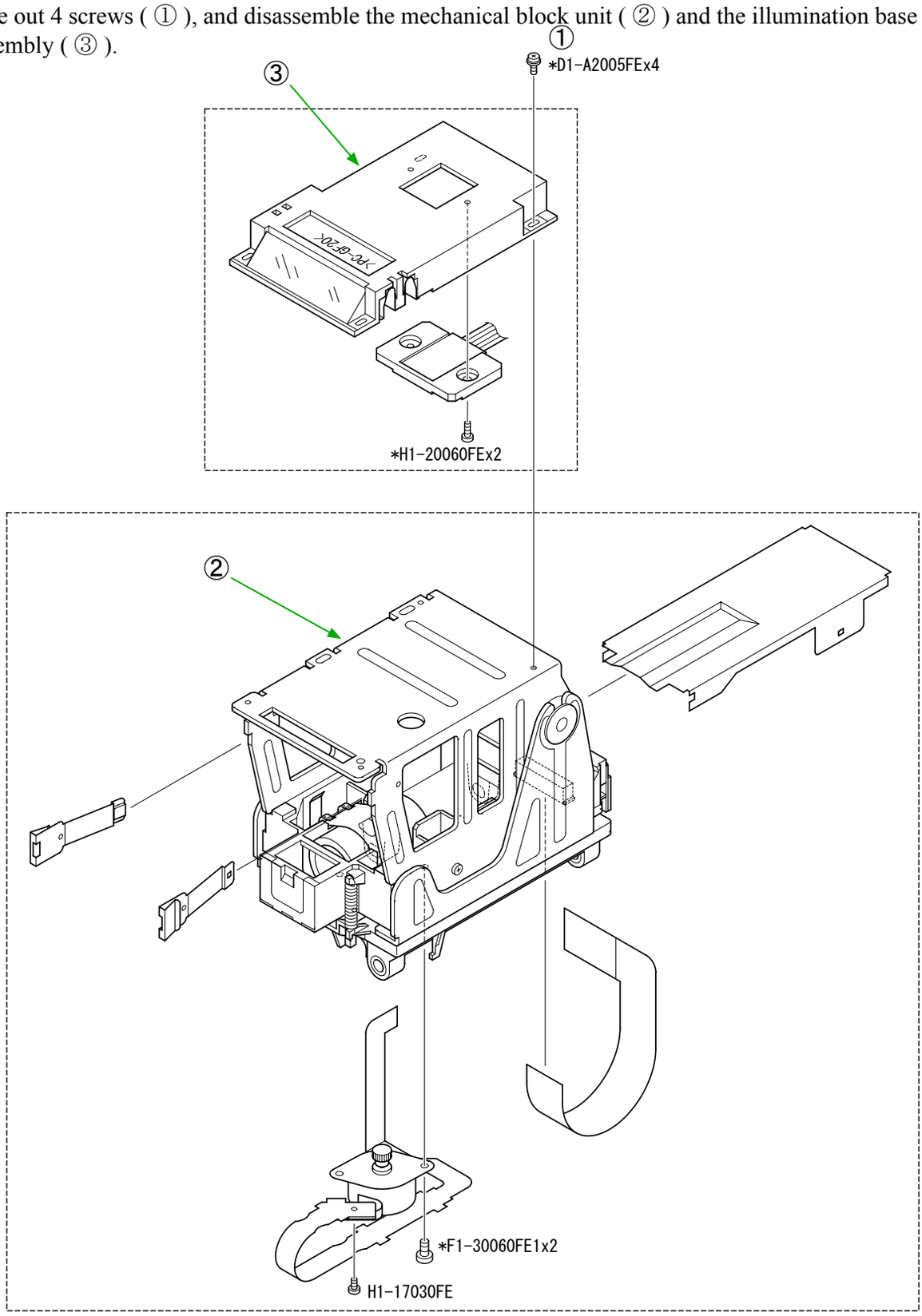


8. Mechanical block unit

※ Whenever the illumination base assembly is disassembled, it is necessary to adjust the illumination irregularity.

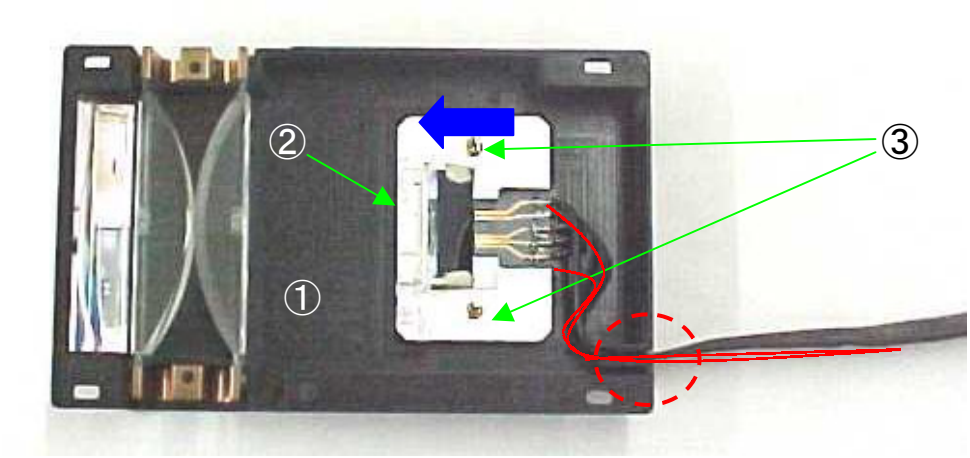
Refer to Page A27 for how to adjust, and also refer to Page 29 for the inspection software and necessary tools.

・Take out 4 screws (①), and disassemble the mechanical block unit (②) and the illumination base assembly (③).



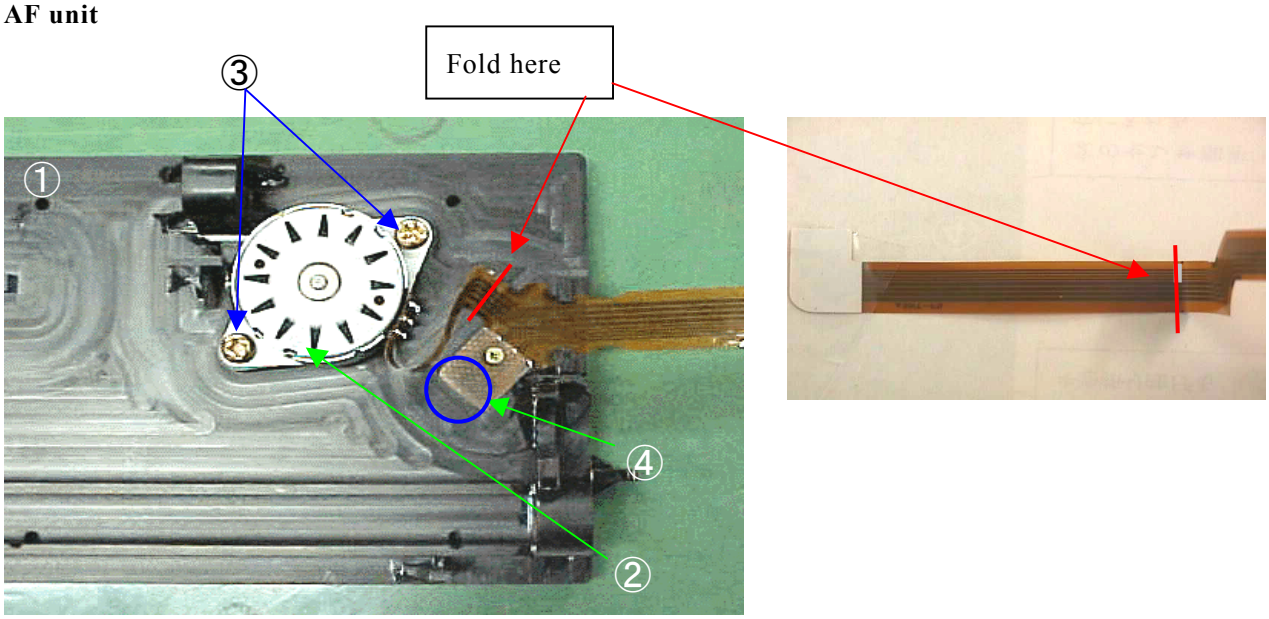
Assembly

1. LED block unit

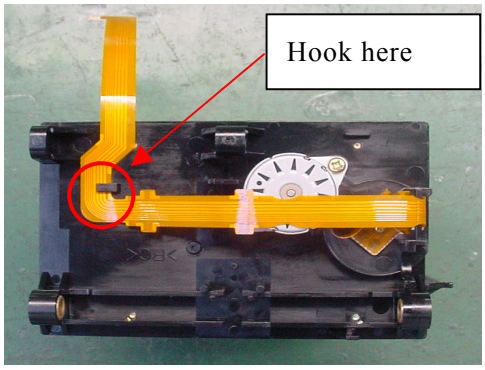


- Attach the LED block unit (2) on the illuminate base assembly (1).
- Put the LED block unit (2) in place by pressing in the direction of (←)and fix it with 2 screws (3).
- While avoiding the twisting of the harness passed through (—) of LED block unit (2), put it in through (○) part of the illuminate base assembly (1) to be pinched.

2. AF unit

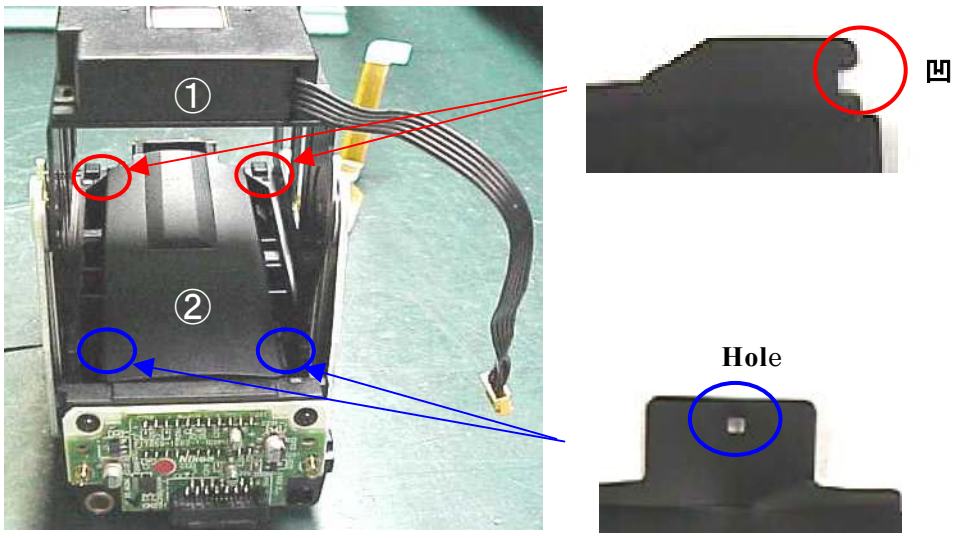


- Attach the AF unit (2) on the scan block unit (1).
- Fold the FPC of the AF unit (2) along each (—) line (of 2 parts).
- Fix the motor unit of the AF unit (2) with 2 screws (3).
- Check if there is no dust attached on the sensor of (○) part.
- Put the inner sensor of (○) part into the hole of scan block unit (1).
- Fix the AF-FPC unit of the AF unit (2) with the screw (4).



・Hook the FPC of the AF unit (2) on the backside of the scan block unit (1) at the above (○) position.

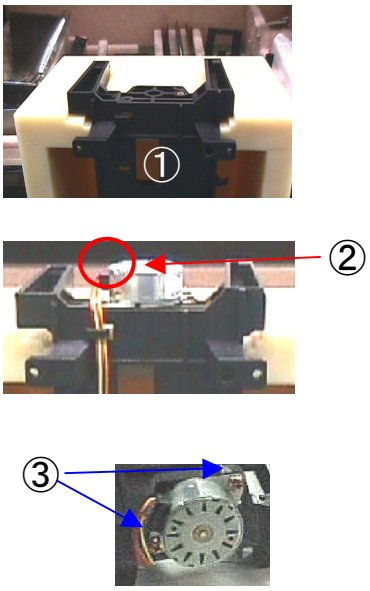
3. Lens cover

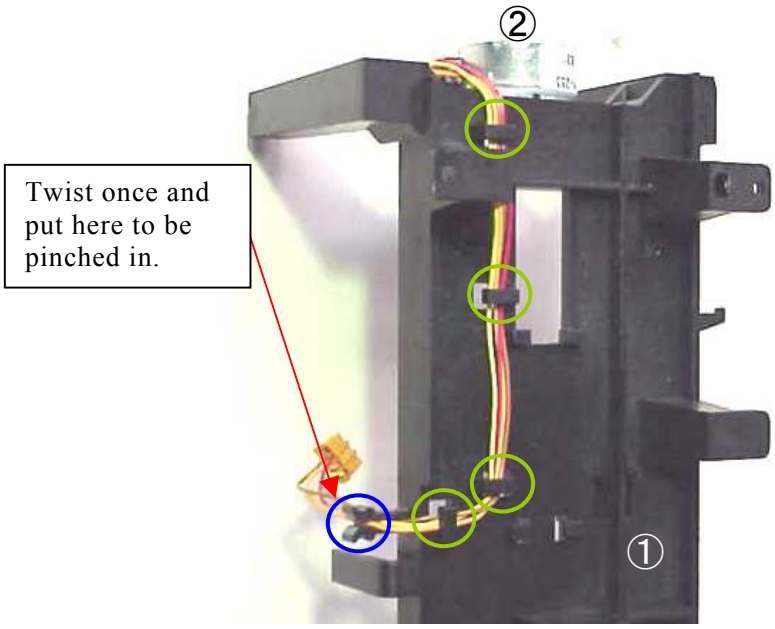


・Check if there is no dust on the whole lens cover (2).

・Attach the lens cover on the mechanical body unit (1) by entering the bosses into the 2 concavities of (○) parts and the 2 holes of (○) parts.

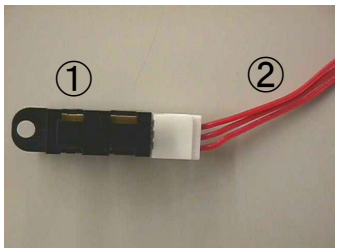
4. Scan motor unit

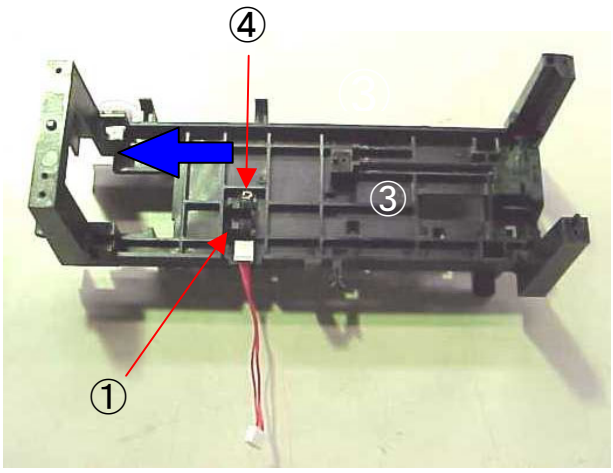




- Attach the harness of the scan motor unit (1) on the mechanical base unit (1) so that (○) part of the harness is positioned at the left side.
- Fix the scan motor unit (2) with 2 screws (3).
- Hook the harness of the scan motor unit (2) to the claws of the backside of the mechanical base unit (1) at the above 4 positions as shown by (○) and pinch one part of the harness at the above (○) position.

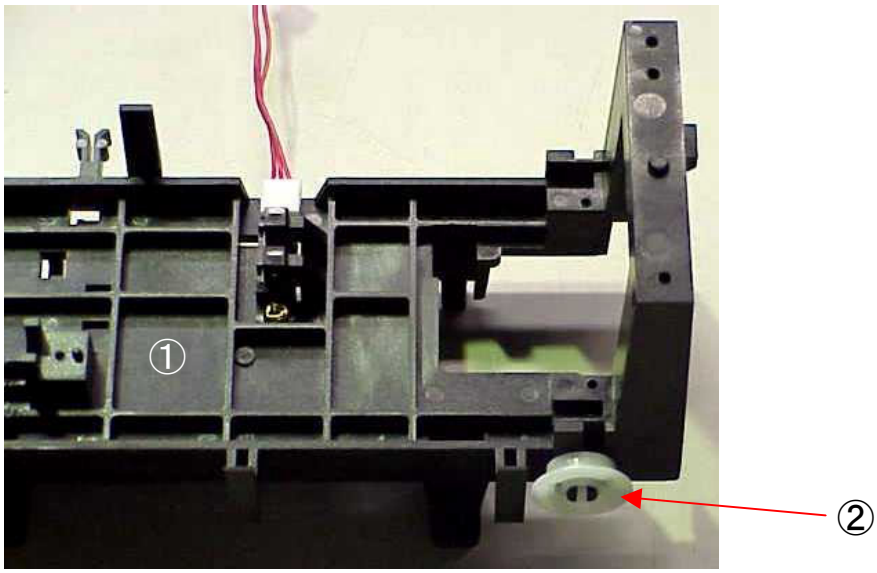
5. Photo interrupter





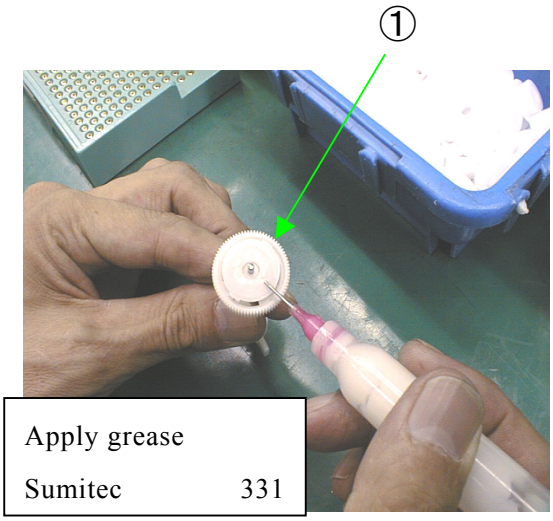
- Connect the photo interrupter harness (2) to the photo interrupter (1).
- Attach the photo interrupter (1) on the mechanical base unit (3).
- Fix the photo interrupter (1) with the screw (4) by pressing it in the direction of (←).

6. Scanning spring pulley

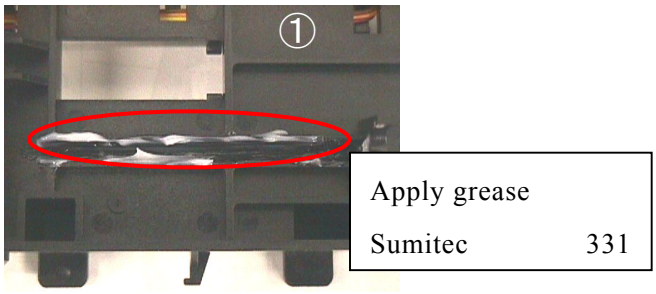


・Attach the scanning spring pulley (2) on the mechanical base unit (1).

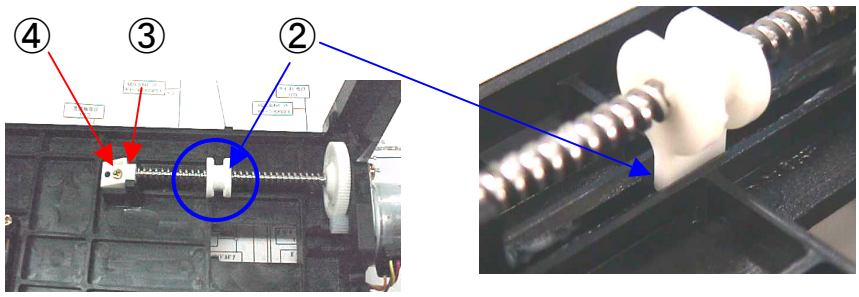
7. Lead screw unit



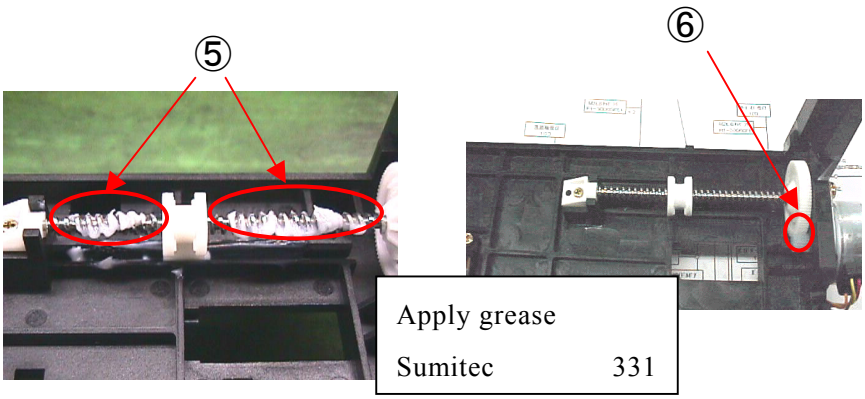
・Apply the grease (Sumitec 331 J67033) to the thrust spring retainer of the lead screw unit (1).



・Apply the grease (Sumitec 331 J67033) on the mechanical base unit (1) at the above (○) part.

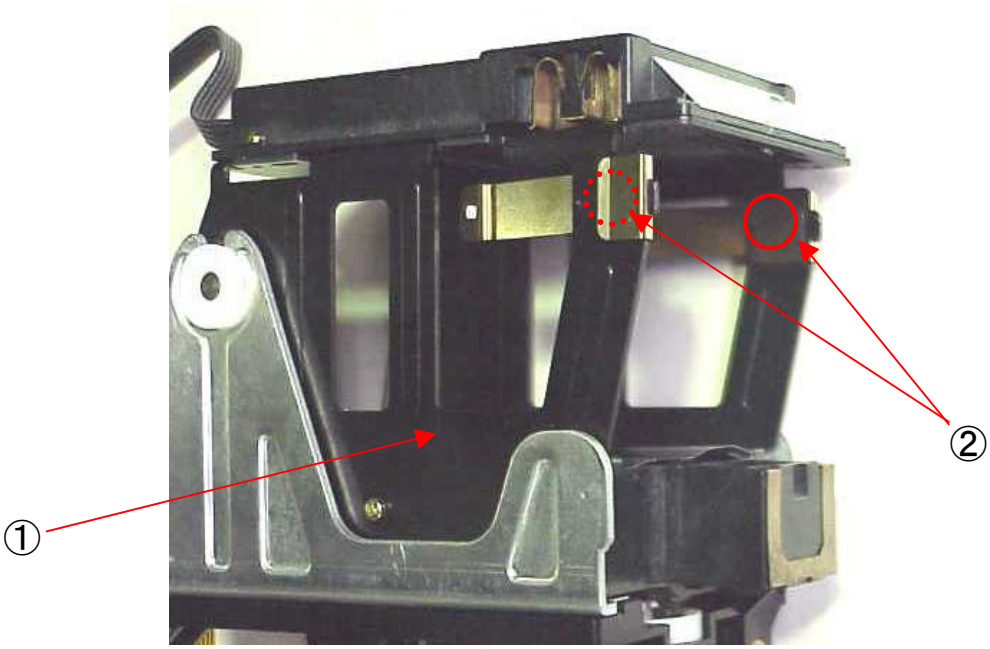


・Enter the head of nut of the lead screw unit (2) into the groove of the mechanical base unit (1) as shown by (○), and attach them.
・Attach the lead screw receiver (3) on the mechanical base unit (1).
・Fix the lead screw receiver (3) with the screw (4).



・Apply the grease (Sumitec 331 J67033) to the shafts of the lead screw unit (5) as shown by (○).
・Apply the rice-grain sized grease (Sumitec 331 J67033) to (○) part between the motor gear of the mechanical base unit (6).and the lead screw unit.

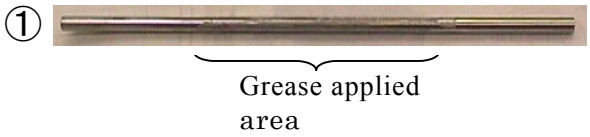
8. Vibration-proof spring



・Align the bosses of the mechanical block unit (1) with the holes of the vibration-proof spring units (2), and assemble them.

9. Mechanical block unit

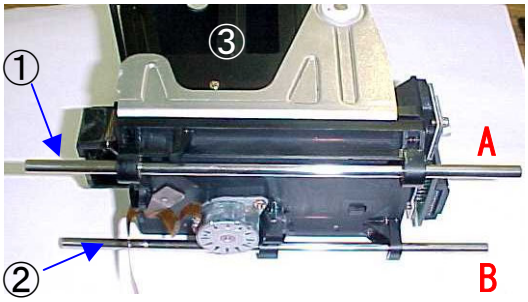
9 – 1. Apply grease on guide bar



Apply grease	
Sumitec	331

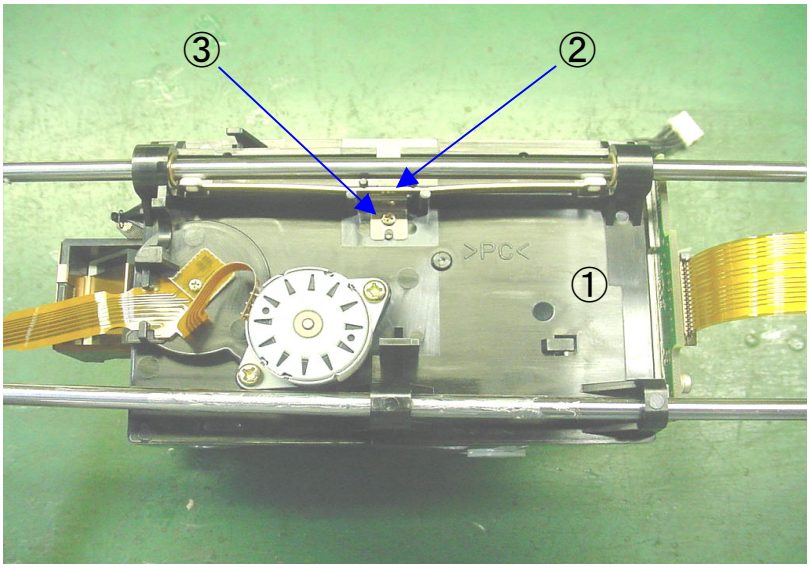
・Apply the grease (Sumitech 331　J67033) to the guide bar (1).

9 – 2. Attach Guide bar



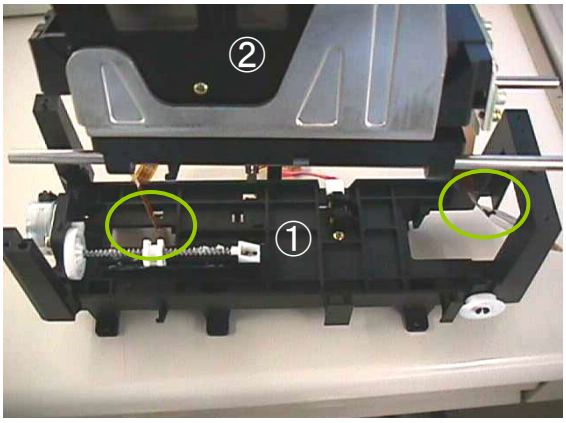
・Pass the guide bar (1) (without grease) through on the **A** side of the mechanical block unit (3).
・Pass the guide bar (2) (with grease) through on the **B** side of the mechanical block unit (3).

9 – 3. Attach Scanning vibration-proof spring

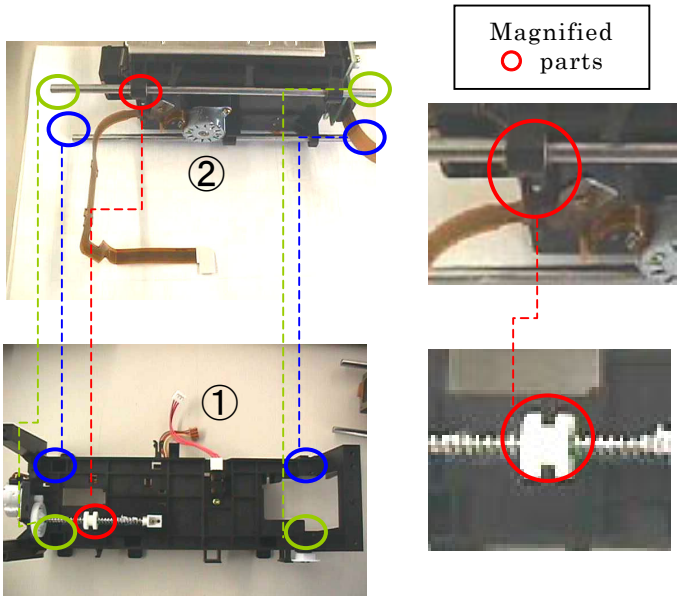


・ Attach the scanning vibration-proof spring unit (2) on the mechanical block unit (1).
・ Fix the scanning vibration-proof spring unit (2) with the screw (3).

9 – 4. Attach Mechanical block unit



・Pass the 2 FPCs of the mechanical block unit (2) through at the above (○) parts of the mechanical base unit (1).

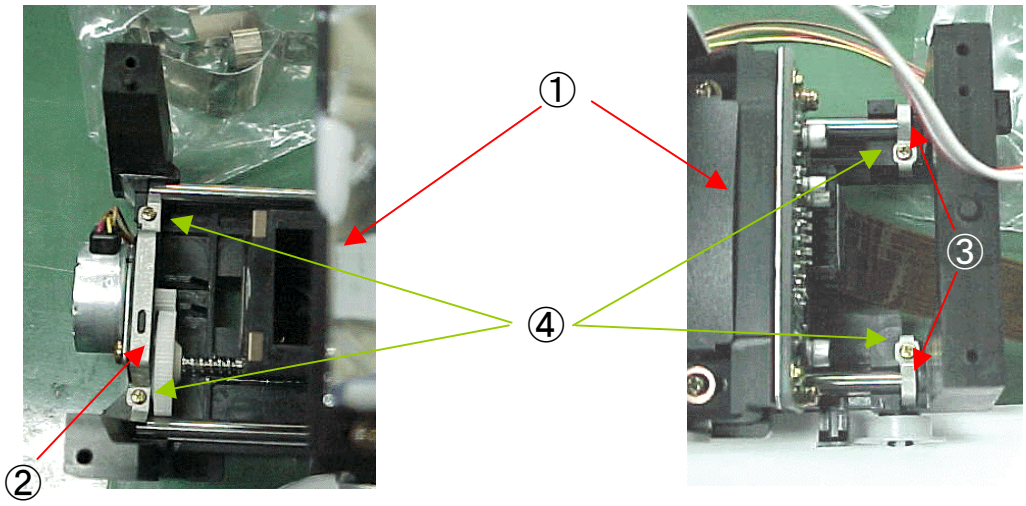


・Align the (○) part of the mechanical block unit (2) with the groove of (○) part of the mechanical base unit (1).

・Align the convexity of (○) part of the mechanical block unit (2) with the groove of (○) of the mechanical base unit (1).

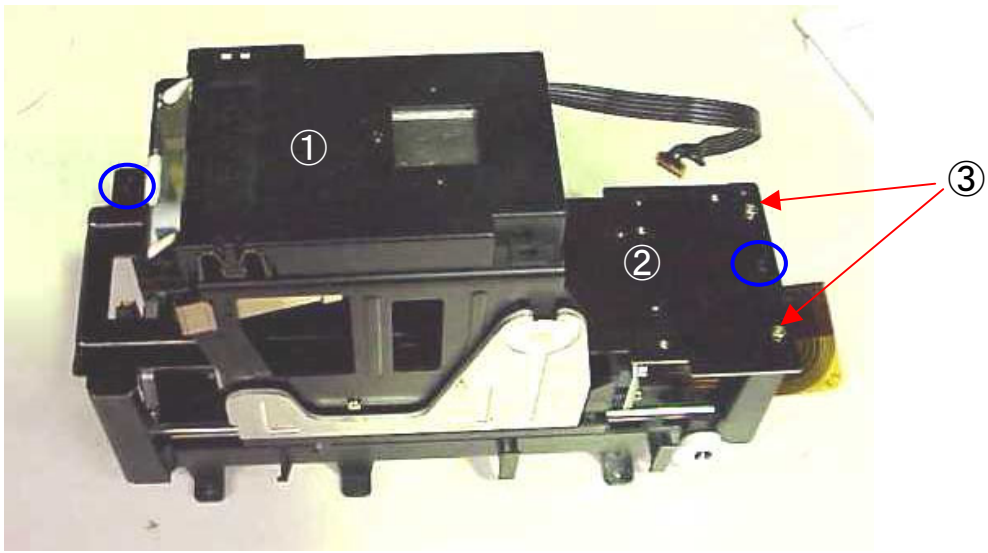
・Align the (○) part of the mechanical block unit (2) with the groove of (○) of the mechanical base unit (1).

10. Guide bar retaining plate



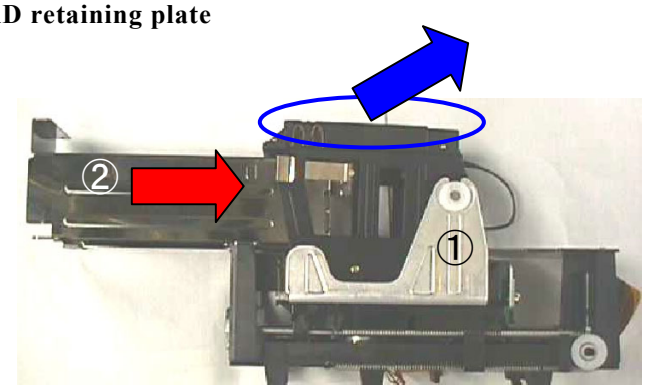
・Attach the guide bar plate A (2) and the guide bar plate B (3) on the mechanical base unit (1).
・Fix the guide bar plate A (2) and guide bar plate B (3) with 4 screws (4).

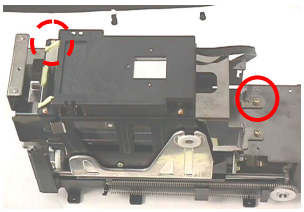
11. AD installing plate



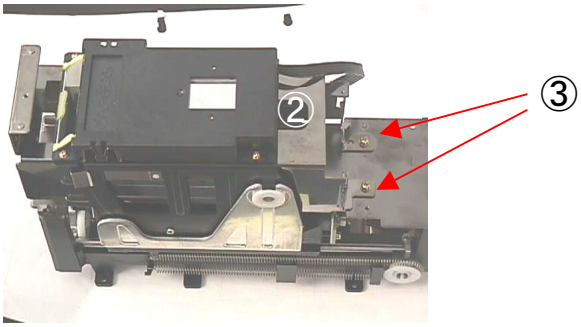
・Attach the AD installing plate (2) on the mechanical base unit (1) by aligning the bosses at the above 2 positions as shown by (○).
・Fix the AD installing plate (2) with 2 screws (3).

12. AD retaining plate



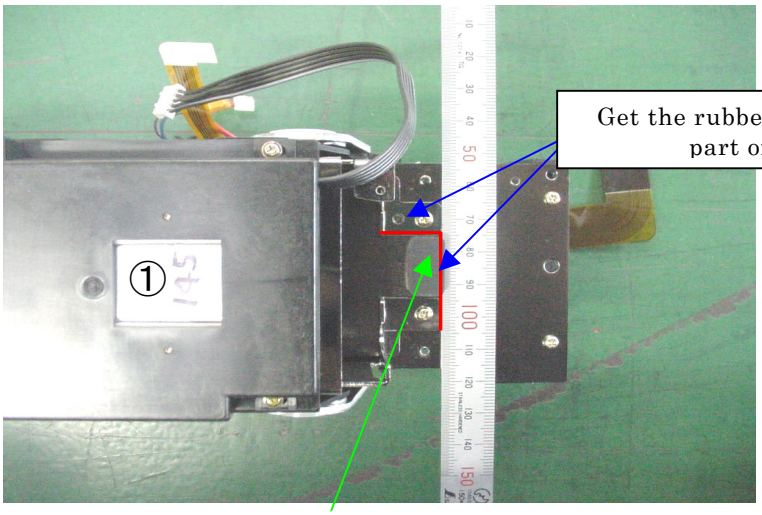


・While lifting the mechanical block unit (1) in the direction of ( ), push the AD retaining plate (2) in the direction of ( ) by aligning the bosses at the above 2 positions as shown by ( ).



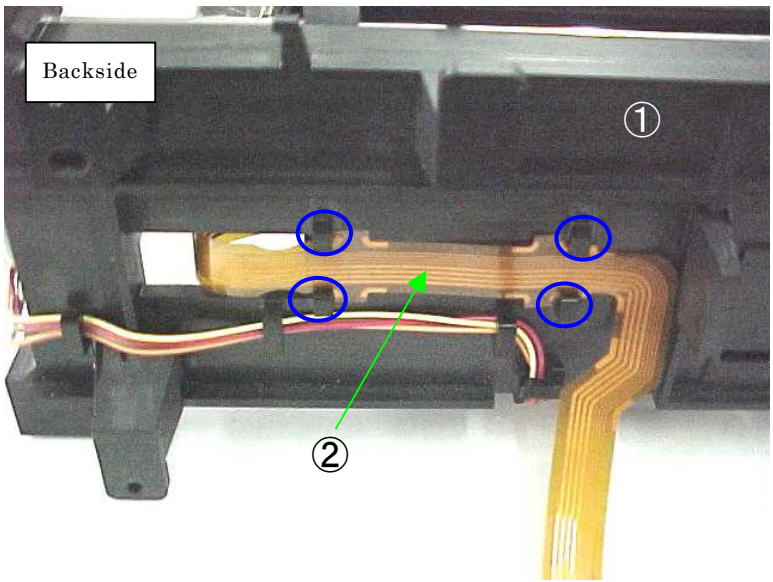
・Fix the AD retaining plate (2) with 2 screws (3).

13. Connector hold rubber



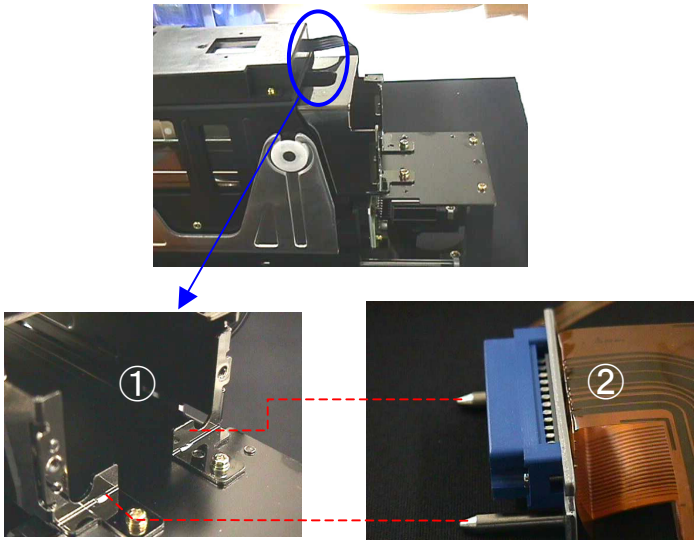
・Attach the connector hold rubber (2) on the mechanical base unit (1).

14. AF-FPC

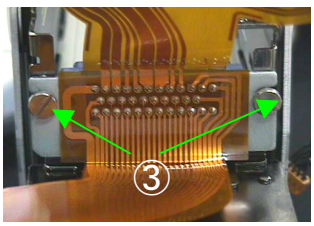


・Hook the FPC of the AF unit (2) to the claws of the mechanical base unit (1) at the above 4 parts as shown by (○).

15. AD-FPC

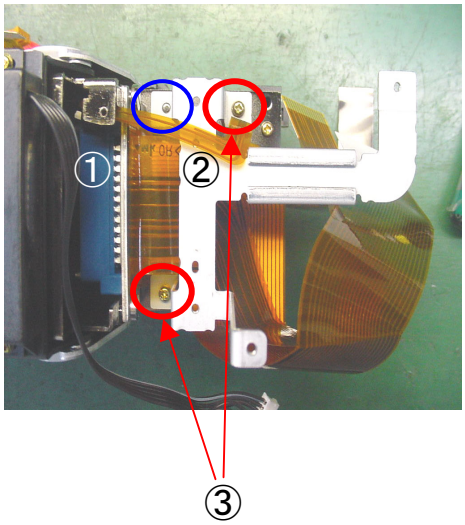


・Attach the AD-FPC (2) to the mechanical base unit (1) by passing the claws through the holes.

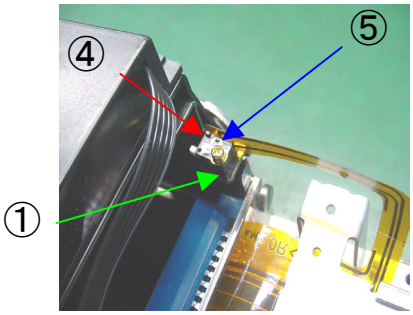


・Fix the AD-FPC (2) with 2 screws (3).

16. Film rail plate

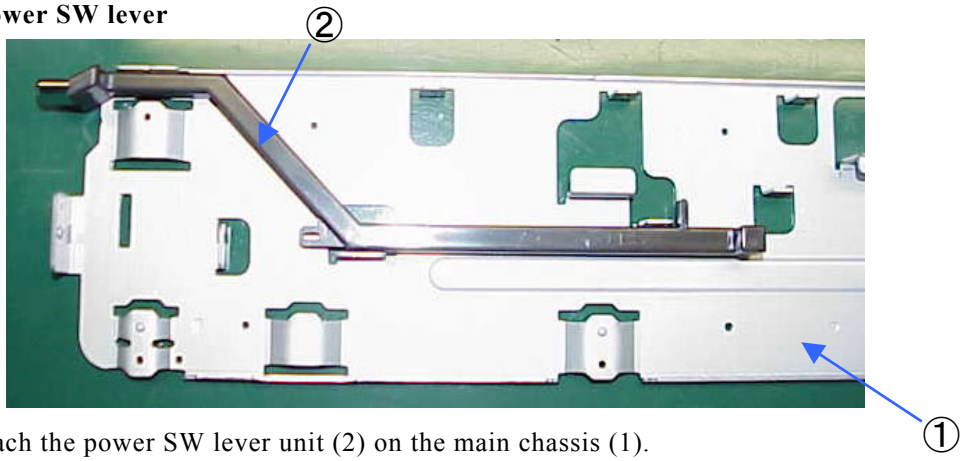


・Attach the film rail plate (2) on the mechanical base unit (1) by aligning the bosses as shown by (○).
・Fix the film rail plate with 2 screws (3) at the above (○) positions.



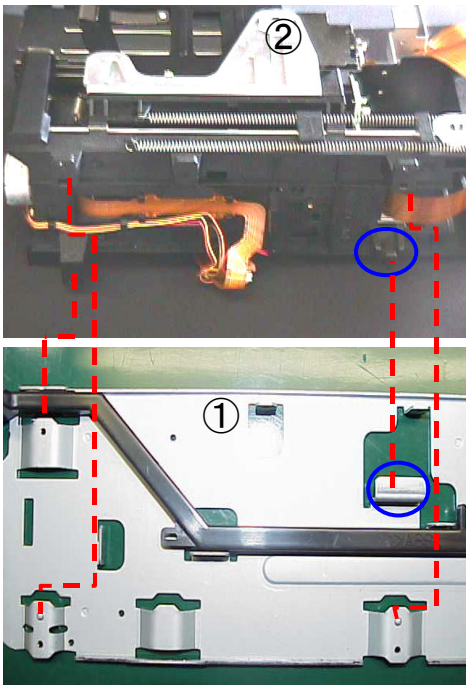
・Enter the boss of the sensor of the AD-FPC unit (4) in the notch of the mechanical base unit (1) and fix them with the screw (5).
・Check if the head of the sensor of the AD-FPC unit (4) operates smoothly.

17. Power SW lever

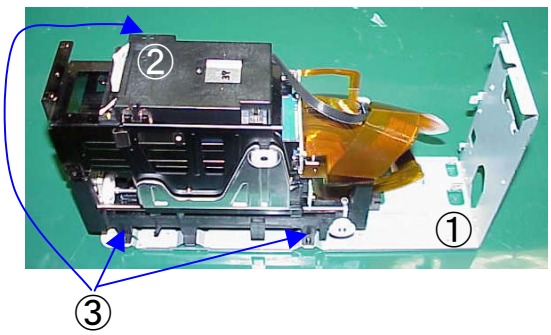


・Attach the power SW lever unit (2) on the main chassis (1).

18. Mechanical base unit

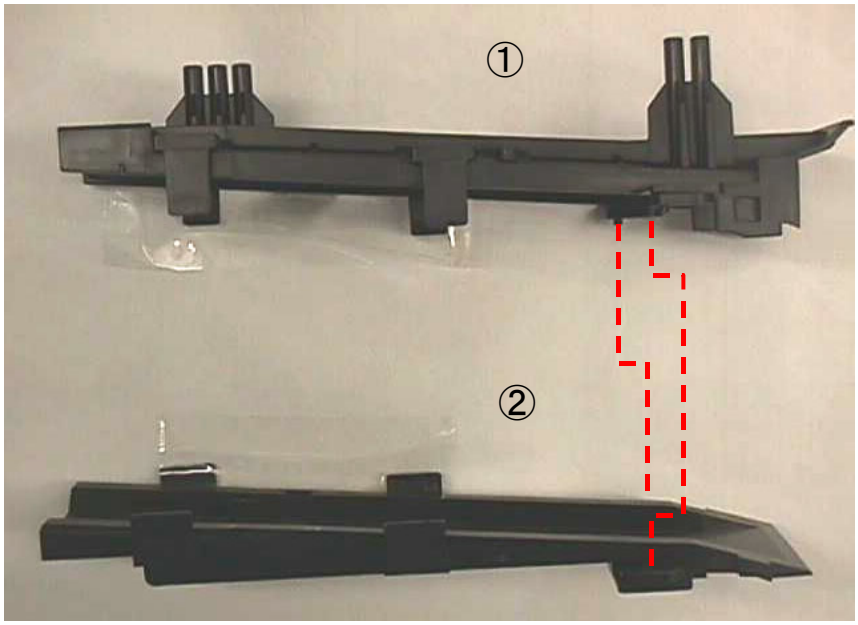


・Hook the claw of the mechanical base unit (2) to the notch of the main chassis (1) as shown by (○) and attach them.

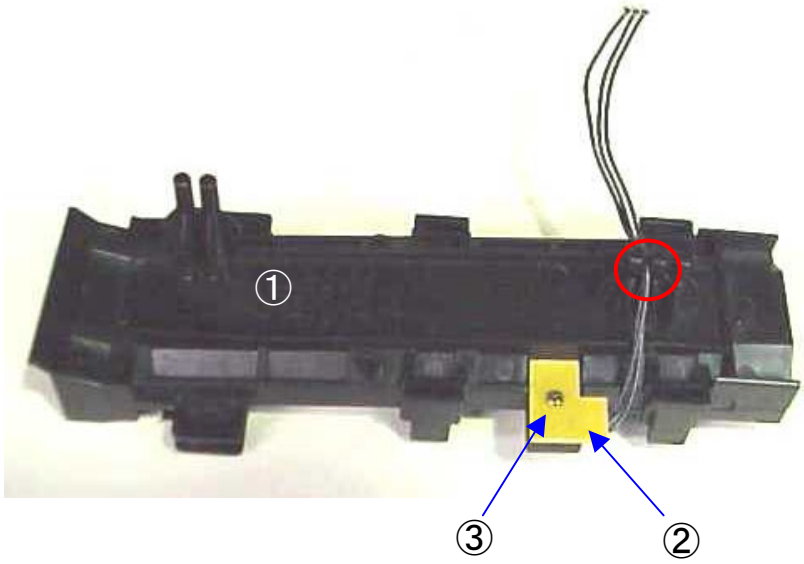


・Fix the mechanical base unit (2) with 3 screws (3).

19. Film rail



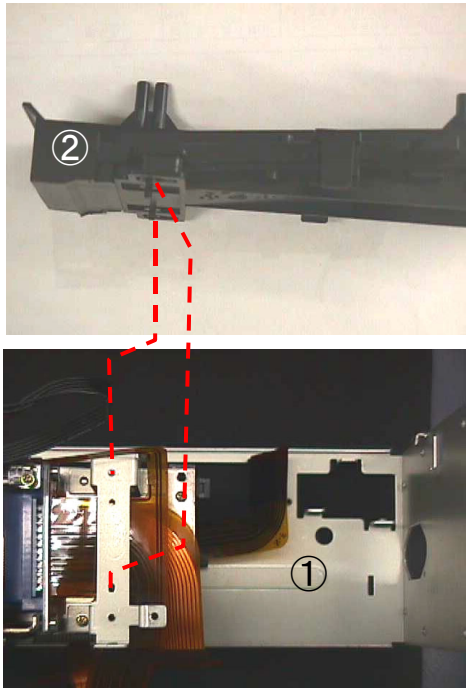
・Assemble the film rails by aligning the bosses of the upper film rail (1) and lower film rail (2).

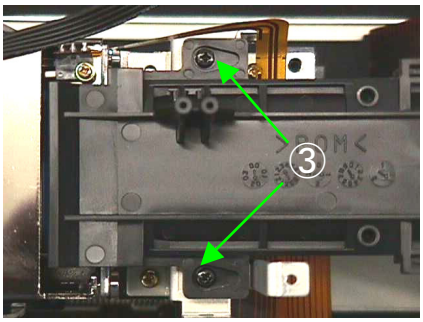


・Attach the rail perforation sensor unit (2) on the film rail (1) with the screw (3).

・Put the harness of the rail perforation unit (2) in through (○) part of the film rail to be pinched.

20. Attach Film rail

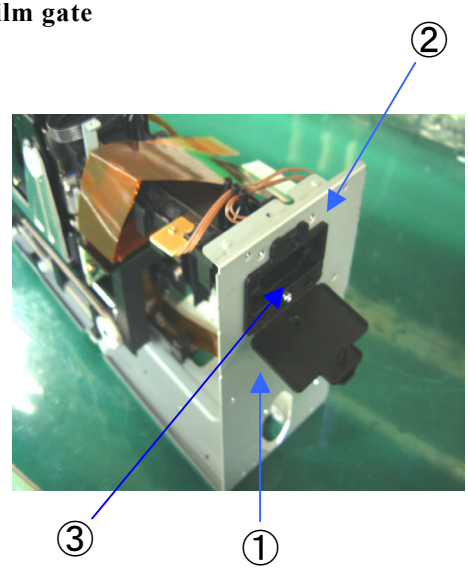


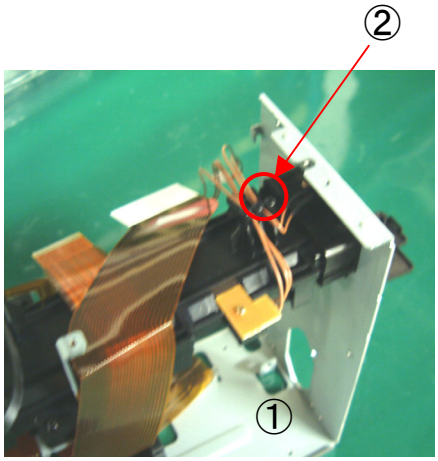


・Align the boss of the upper/lower film rails (2) with the hole of the mechanical base unit (1), and assemble them.

・Fix the film rails (2) with 2 screws (3).

21. Film gate



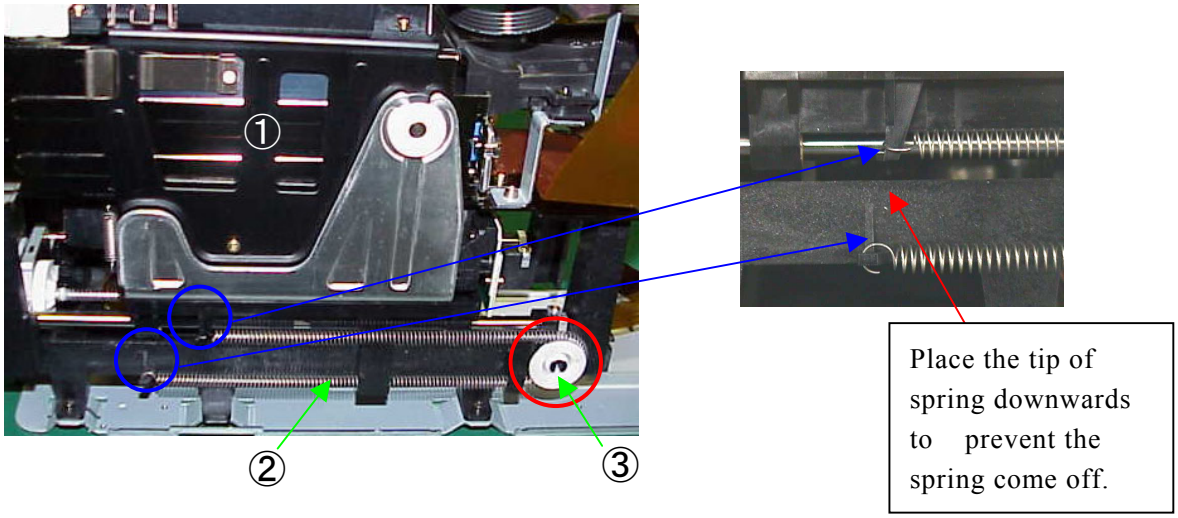


・Attach the film gate unit (2) on the mechanical base unit (1).

・Fix the film gate unit (2) with the screw (3).

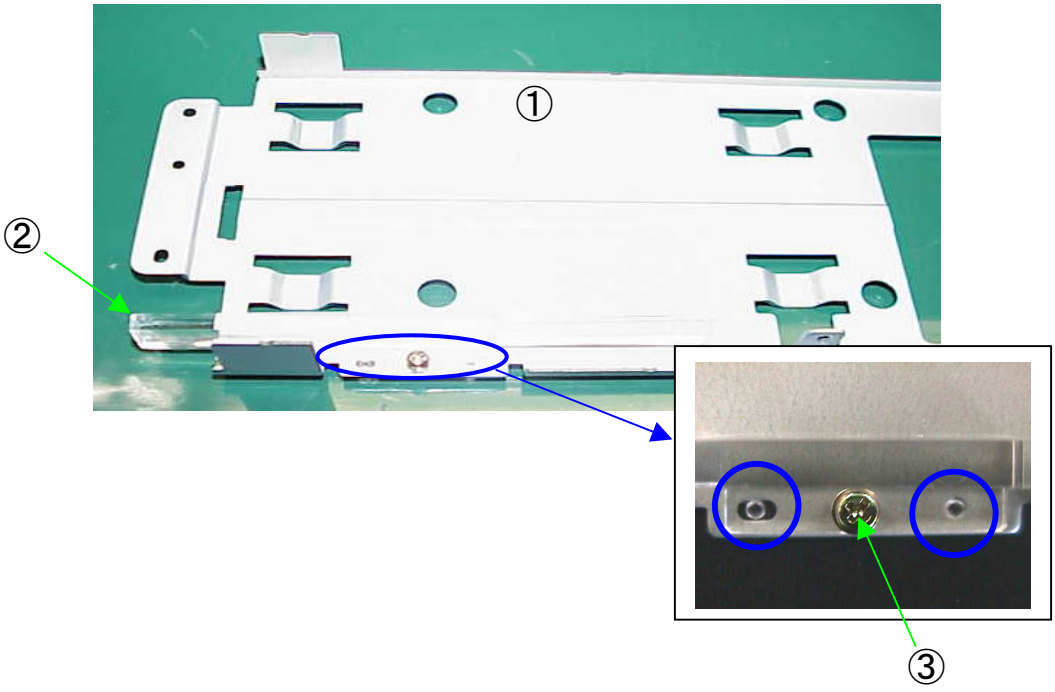
・Put the harness of the film gate unit (2) in through (○) part of the mechanical base unit (1) to be pinched.

22. Scanning spring



・Hook both ends of the scanning spring (2) to the (○) part of the mechanical base unit (1), and also hook part of the spring to (○) part of the scanning spring pulley (3).

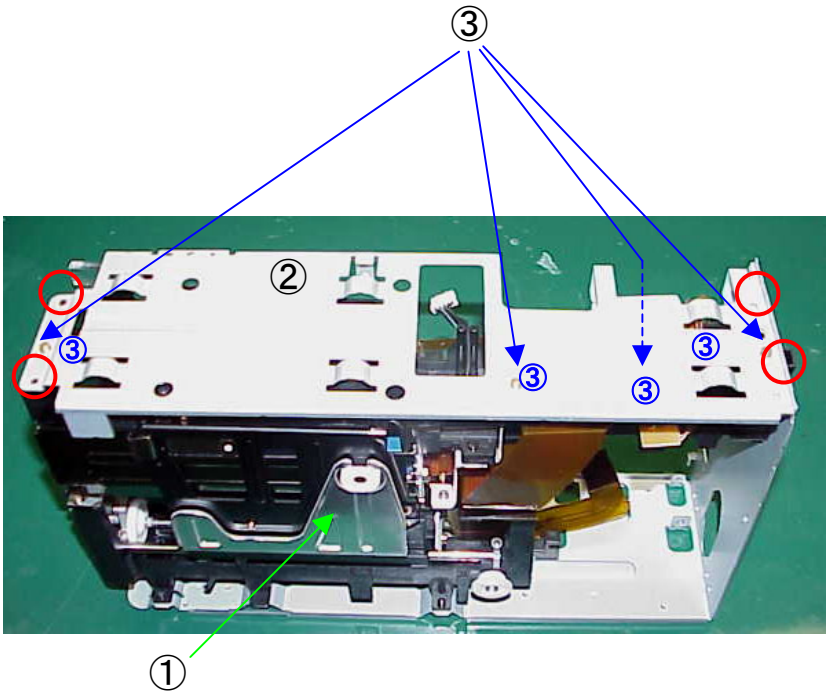
23. Light guide



・Attach the light guide (2) to the top chassis (1) by aligning the bosses at the above 2 positions as shown by (○).

・Fix the light guide (2) with the screw (3).

24. Top chassis

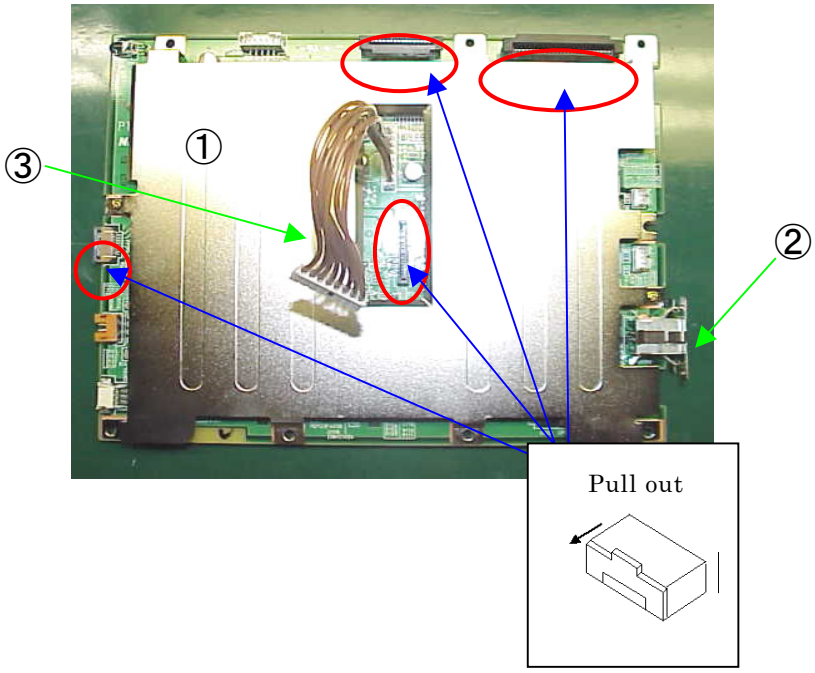


・Attach the top chassis (2) on the mechanical base unit (1) by aligning the bosses at 4 positions as shown by (○).

・Fix the top chassis (2) with 4 screws (3) in the order from **(3)-1** to **(3)-4**.

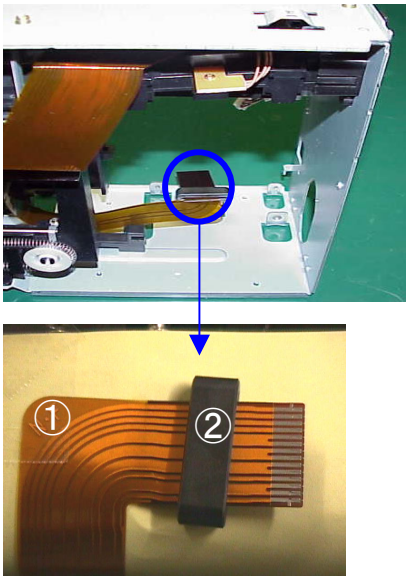
25. Main PCB

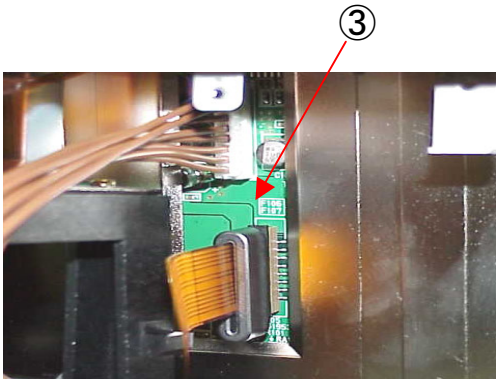
25-1. Attach Power-supply harness



- Push the connector shield plate A (2) to the main PCB unit (1) until it clicks.
- Connect the power-supply harness (3) to the main PCB unit (1).
- Pull out the locks at the above 4 parts as shown by (○) of each connector.

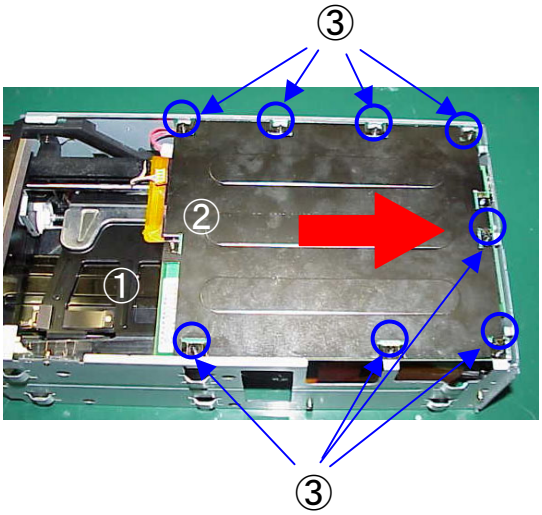
25-2. Attach CCD-FPC

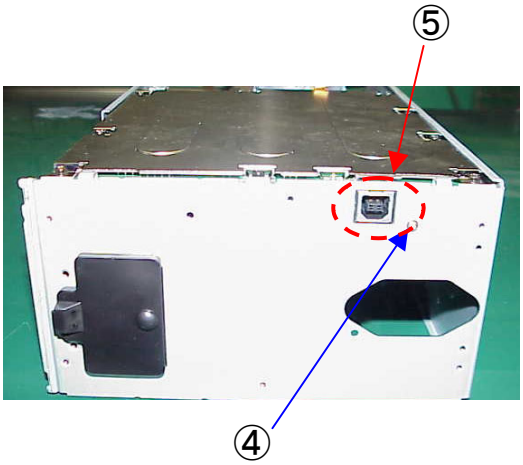




- Insert the CCD-FPC (1) into the ferrite core (2).
- Connect the CCD-FPC to the main PCB unit (3).

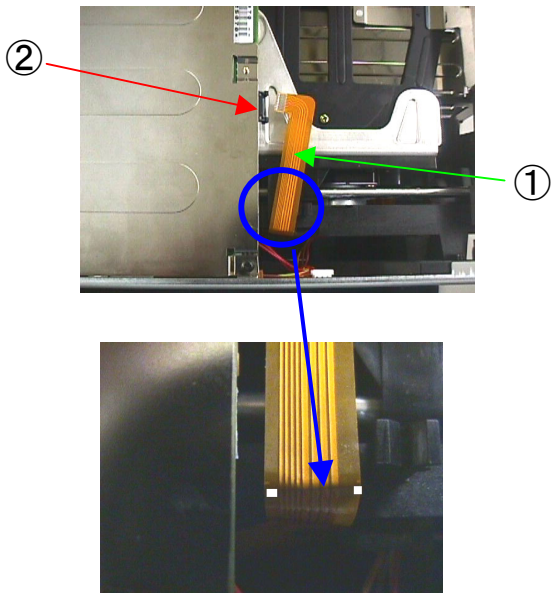
25-3. Attach Main PCB

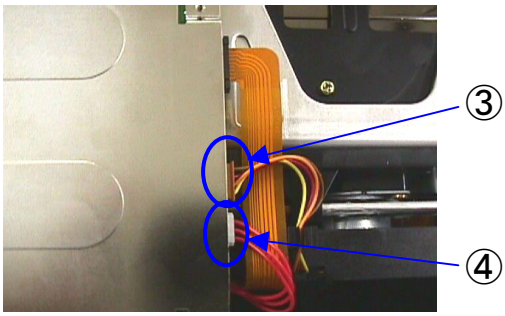




- Attach the main PCB unit (2) on the mechanical base unit (1).
- Put the main PCB unit (2) by pressing it in the direction of (→), and fix it with 8 screws (3).
- Fix the connector shield plate A (5) with the screw (4).

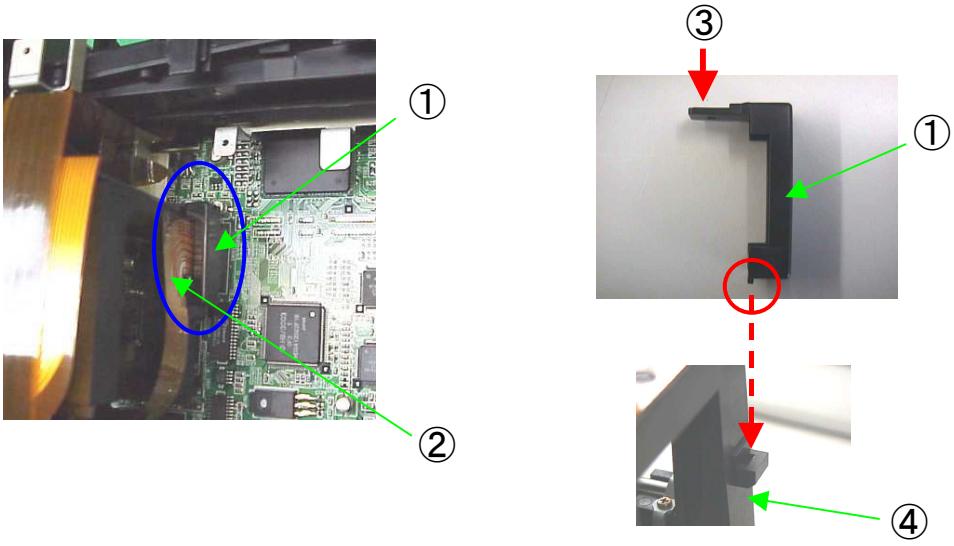
26. Attach AF-FPC / Scan motor harness





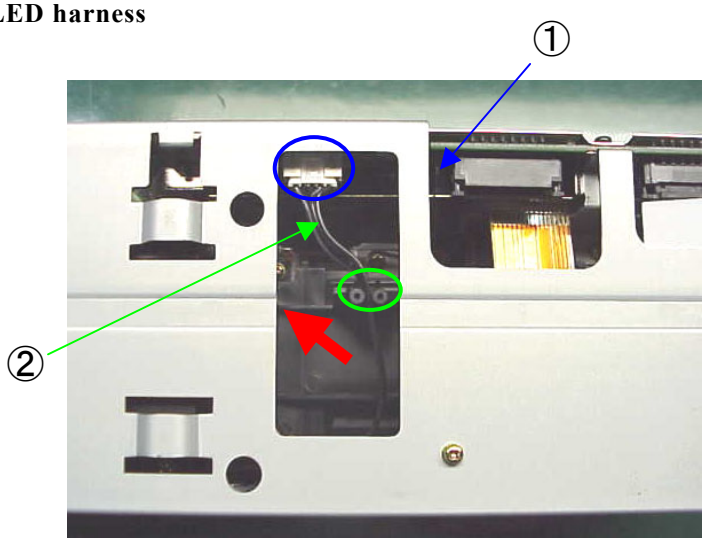
- Fold the AF-FPC (1) along the folding marks as shown by (○).
- Connect the AF-FPC (1) to the connector of the main PCB unit (2).
- Connect the harness (4 lines) of the scan motor unit (3) and the harness (3 lines) of the photo interrupter (4) to the main PCB unit (2).

27. Core holder



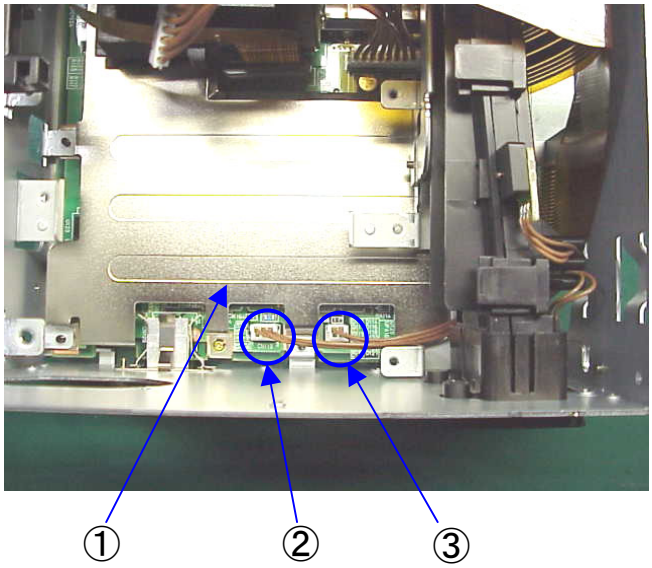
・Put the ferrite core (2) in the core holder (1).
・Put the claw of the core holder (1) into the groove of the mechanical base unit (4).
・Fix the core holder (1) from above with the screw (3).

28. LED harness



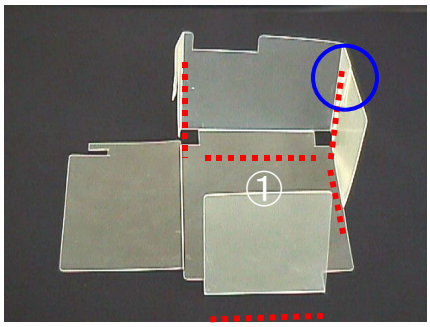
・Connect the LED harness to (○) part of the main PCB unit (1).
・Put the LED harness (2) in (○) part to be pinched.
・Be careful NOT to pinch the LED harness (2) at the position indicated by (↑).

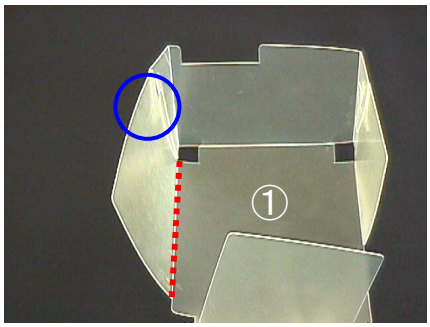
29. Rail perforation sensor harness



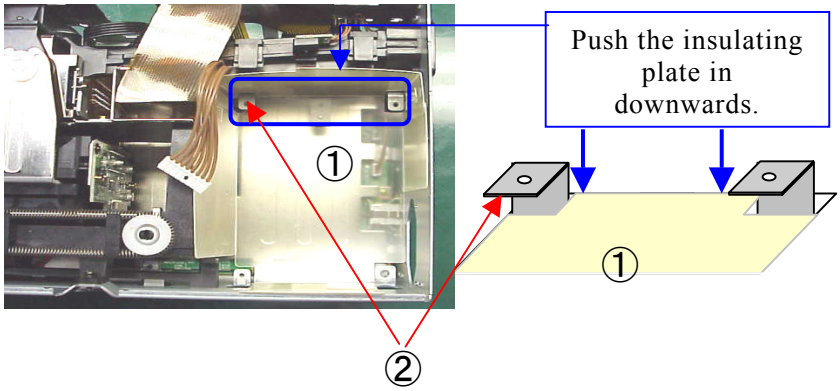
・Connect the harness (3 lines) of the rail perforation sensor unit (2) and the harness (2 lines) of the lid release SW (3) to the main PCB unit (1) as shown by (○).

30. PS insulating plate



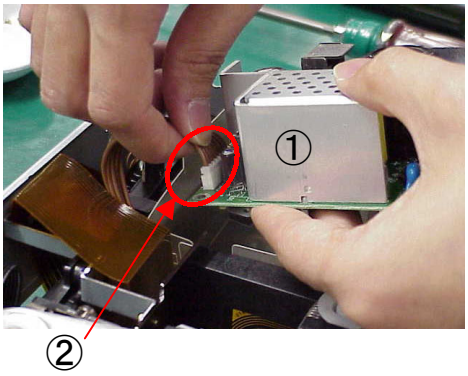


・Make a valley fold along the line of ( ) of the PS insulating plate (1), and frame it by hooking at (○) part.

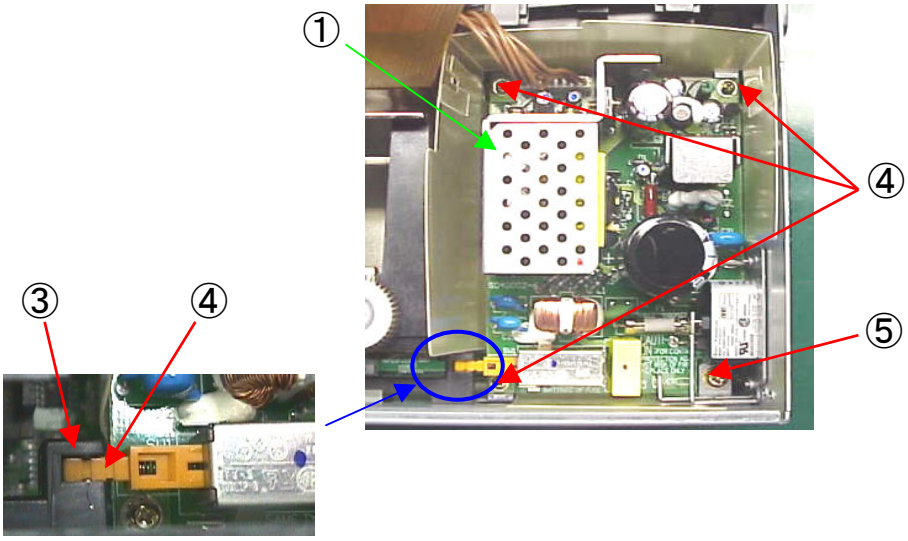


・Push the PS insulating plate (1) in the chassis (2) downwards as shown by (□), and assemble them.

31. Power supply unit

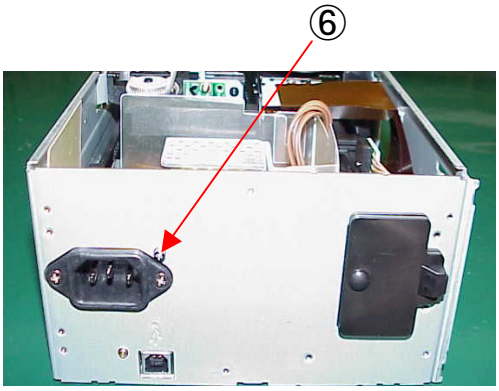


・Connect the connector of the power-supply harness (2) to the power supply unit (1).



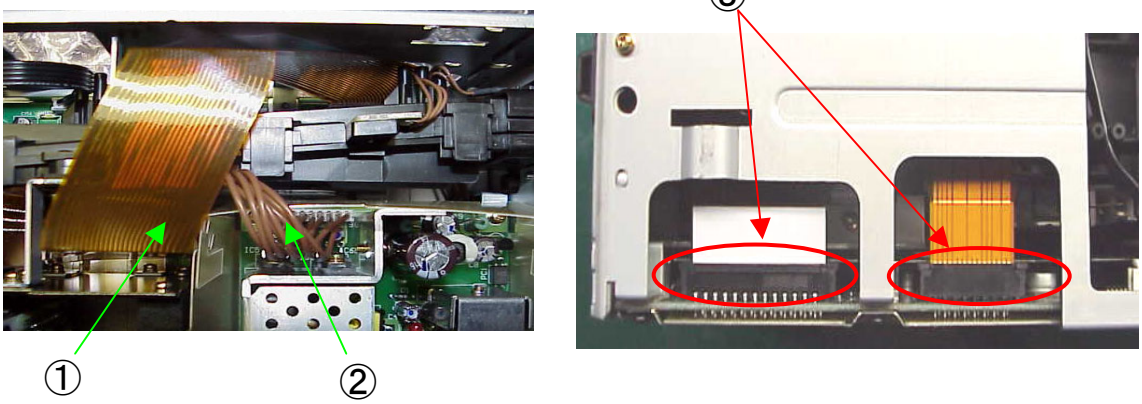
・Align the convexity of the SW of the power-supply unit (4) with the concavity of the power-supply SW bar (3), and assemble them.

・Fix the power supply unit (1) with 3 screws (4) and 1 screw (5).



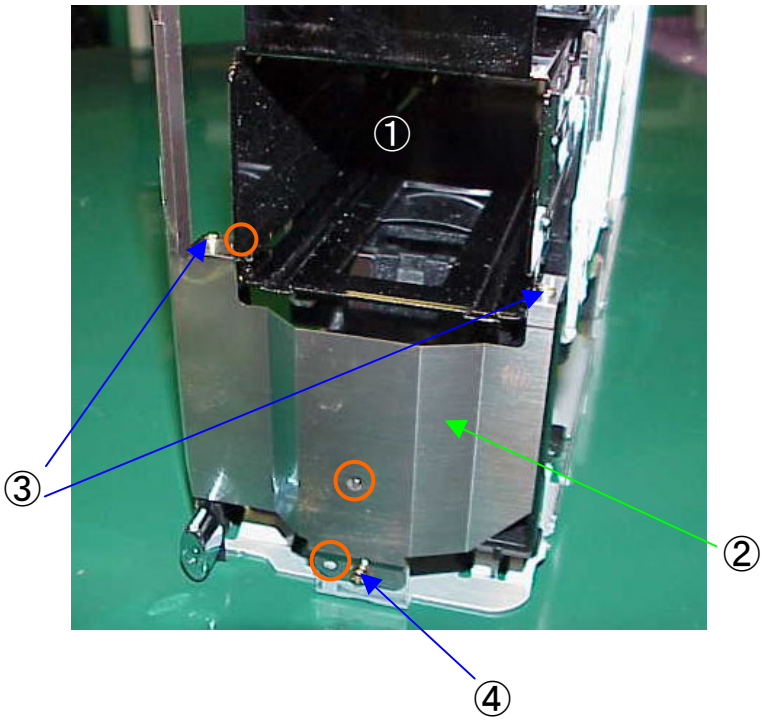
・Fix the power supply unit (1) with the screw (6).

32. Attach AD-FPC



・Pull the 2 AD-FPCs (1) around to place on the power-supply harness (2), and connect them to the connectors of the main PCB unit (3) respectively.

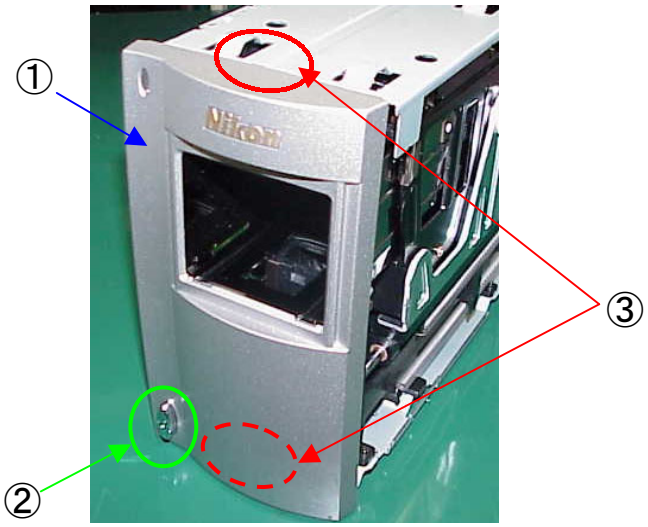
33. Front shield plate



・Align the bosses of the mechanical base unit (1) with the holes of the front shield plate (2) at the positions as shown by (○) to assemble them.

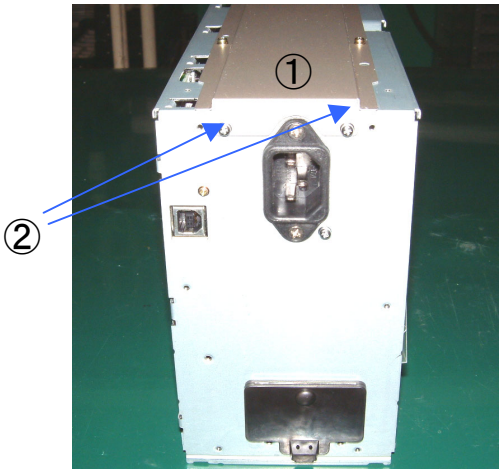
・Fix the front shield plate (2) with 2 screws (3) and 1 screw (4).

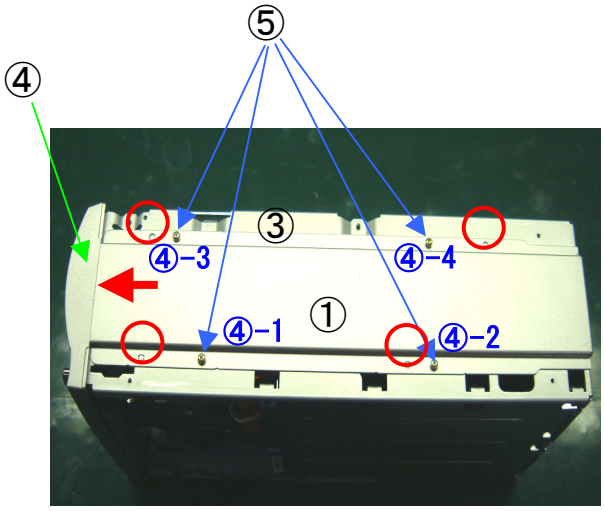
34. Front panel



・Put the power-supply switch (2) into the groove of the front panel (1).
・Hook the claw of the front panel (1) to the groove of the chassis (3), and assemble them.

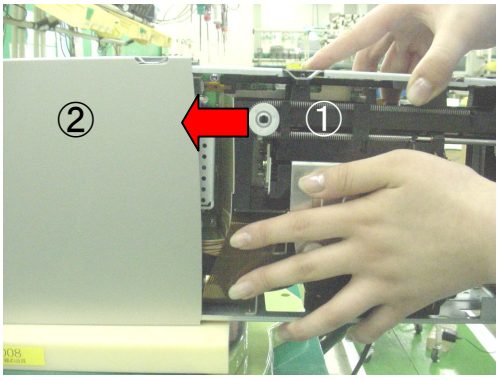
35. Under-panel

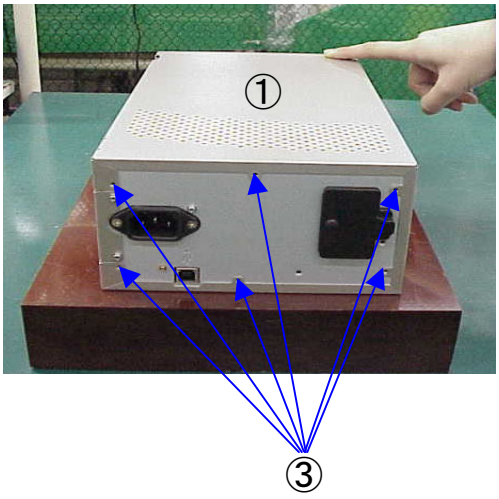




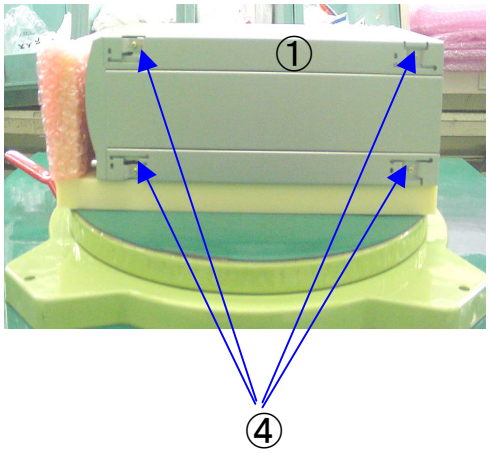
・Fix the rear side of the under-panel (1) with 2 screws (2).
・Reverse the body unit (3), and attach the under-panel (1) to the front-panel unit (4), by pressing it in the direction of (←) and aligning the bosses at 4 positions as shown by (○).
・Fix the bottom of the under-panel (1) with 4 screws (5) in the order from (4)-1 to (4)-4.

36. Top cover



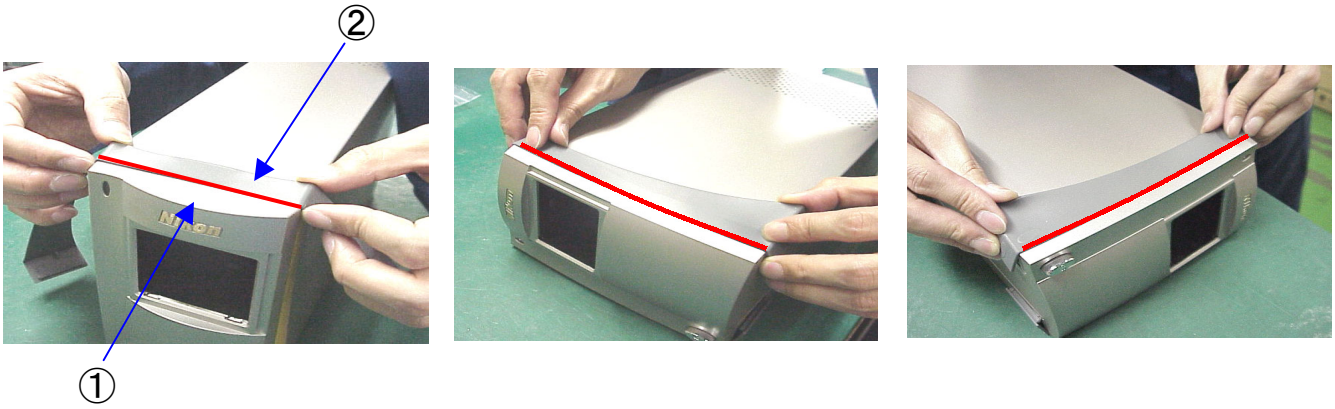


・Reverse the body unit (1) and while sliding in the direction of (←), put it into the top cover (2).
・Lay the body unit (1) along, and tighten 4 screws (3).

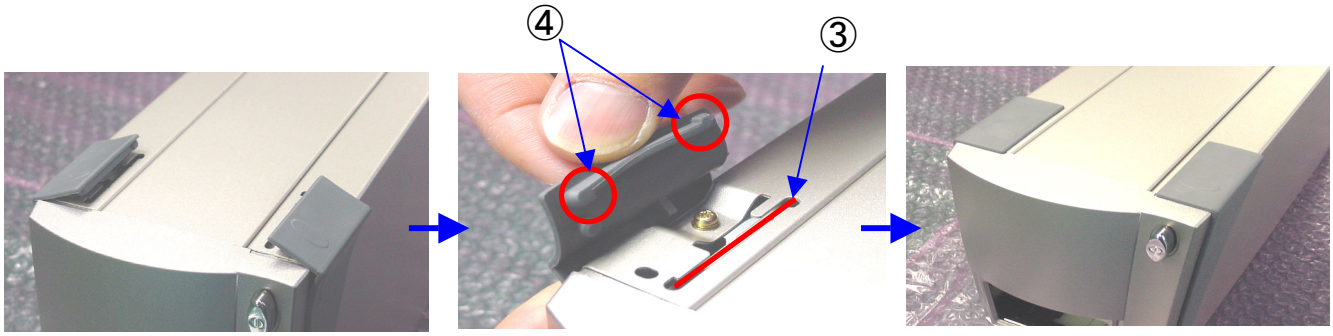


・Lay the body unit (1) along, and tighten 4 screws (4).

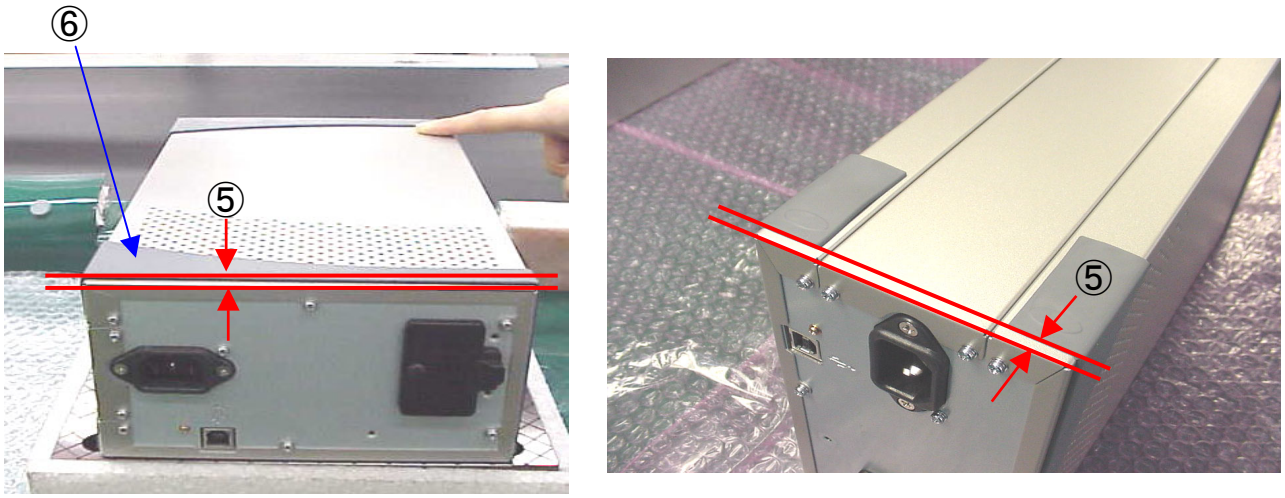
37. Rubber foot



・Put the rubber foot for front (2) along (—) line on the front panel unit (1), and attach it by pressing on from the top to side faces.



・Enter the bosses of the rubber foot for front (4) in the bottom grooves of the body unit (3).



・Attach the rubber foot for rear (6) at 3.5 mm-distance from the backmost edge of the body unit (5).

38. Adjust illumination irregularity

Whenever the LED base unit or the illumination base assembly is disassembled or replaced, adjust the illumination irregularity.

1) Remove the top cover from the scanner body, and connect it to PC.

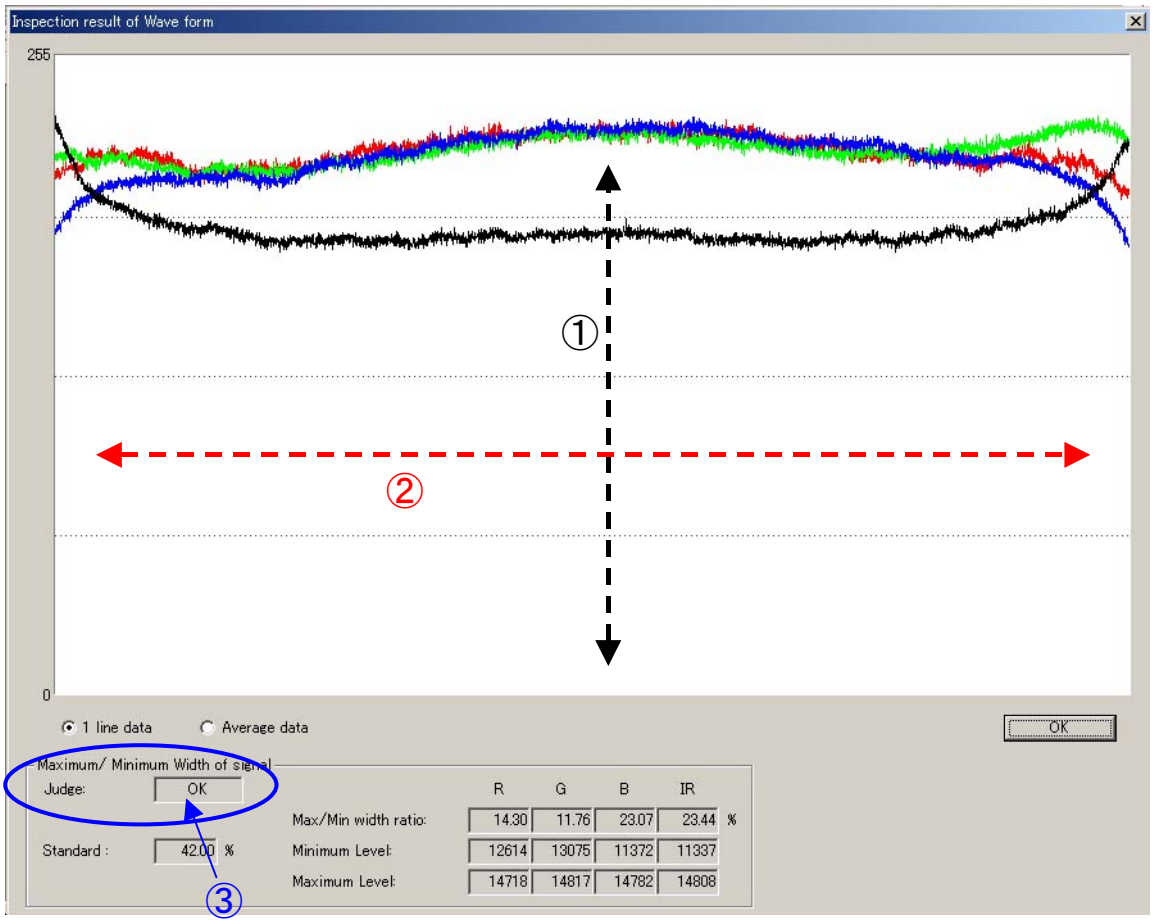
2) Set the inspection chart (J61187) to start up the inspection software (J65050A in Japanese, J65050B in English).

※ Refer to Page on and after A29 for the details of the inspection software.

3) Select “Run” from the main menu and “Illumination Irregularity” from the pulldown menu.

4) The CCD output wave is indicated as below. (In case of LS-50ED, only 1-line data is displayed).

※ The waveform is updated every a few seconds.

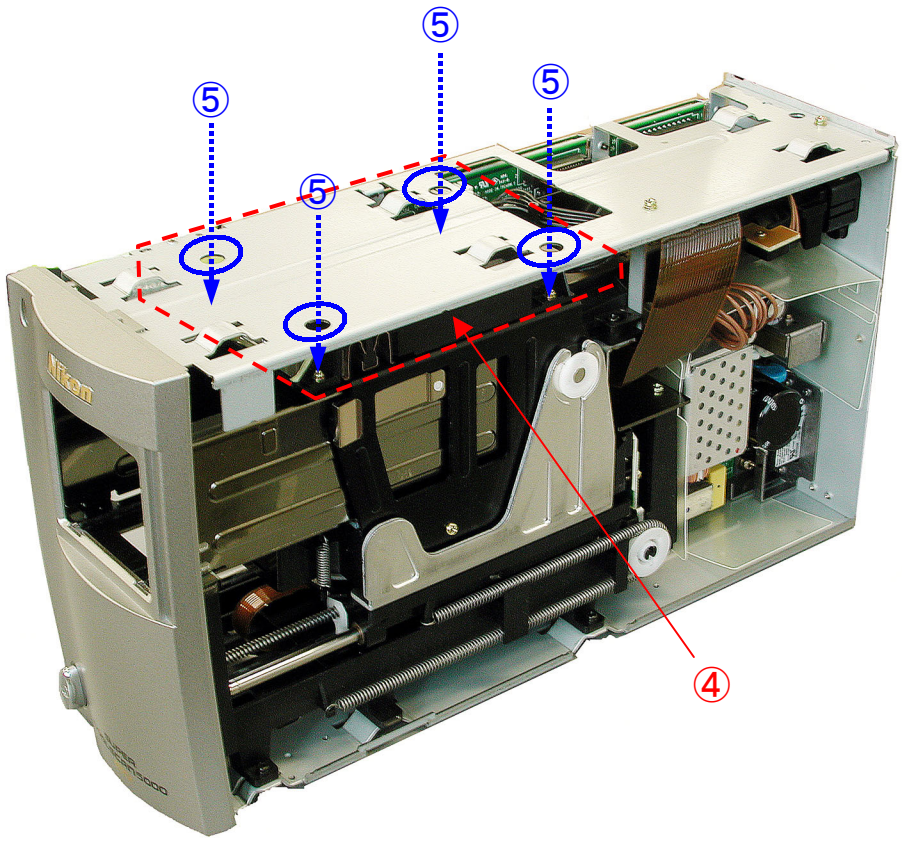


5) Adjust so that the amplitude of the CCD output waveform (1) gets maximum and the waveform (2) becomes as flat as possible.

Meet the standard of the illumination irregularity (3) (Should be 42% or under).

6) Loosen 4 screws (5) of the illumination base assembly (4), and by adjusting the position of the illumination base assembly (4), make an adjustment to meet the standard of 5).

7) Tighten 4 screws (5) to complete.



How to use Inspection Software

1. Purpose

This software is used when LS-5000ED is disassembled or its parts are replaced or inspections are made.

2. Preparation (tools required)

・DOS/V PC
・Inspection chart for （J61187）
・Positive film chart（J61189）; Insert this into MA-21
・IR pass filter (J63088）; Insert this into MA-21
・Inspection software (J65050A: Japanese, J65050B: English)

【Hardware requirements】

・Windows2000
・Japanese/English OS
・CPU　Pentium Ⅲ 700MHz or more
・RAM　256MB or more

3. Inspection details

1) Initialization

・Check the firmware version.

2) Illumination irregularity

・Check for the raw data of the CCD with shading OFF in the standard range.

3) Shading

・Check for the read-in data of the CCD waveform with shading ON in the standard range.

4) Noise inspection

・By performing prescanning operation, check if the operating sound has no problem.

5) Mechanical precision

・ Scanning position accuracy

Get the central position (average values of x, y) of each alignment mark at 4 positions, then comparing them with set values, check the deviation of image scanning position (shading).

・Main/Sub-scan perpendicularity
Get the angles (between the main scanning and sub-scanning) at 3 alignment marks (upper-left, upper-right, lower-right), then comparing them with set values, check the slant of the main scanning direction.

・Magnification
Get the magnification of optical system based on the distance between 2 alignment marks of the main scanning direction.

・Aspect ratio
Get the aspect ratio of the image based on the distance between 2 alignment marks of the sub scanning direction.

・Color registration
Check the color deviation on the image.

・MTF
Check the resolving power based on the contrast of the resolution pattern image.

・Flare
Check dust of optical system.

・Inspect AF focusing accuracy/position
Check the AF focusing accuracy/position.

6) IR pass filter
Check the leak rate of unnecessary light that is included in R-LED.
*Whenever the main PCB or parts of optical system are replaced, it is necessary to rewrite the compensation data.

7) Color reproduction (positive)
Read the positive macbeth chart by scanner, and check the color reproduction of each color.

8) Log record
As for the log numbers, the number of times for scanning, for AF operations, for thumb nails, for initialization, for adapter replacements, the types of adapters, sense data and error details, they are all stored in the flash memory on the main PCB.
*When the main PCB is replaced, it is necessary to write the above data.

9) WB recording time
As a measure against dust on the mirror, the WB time at shipment is stored in the flash memory on the main PCB. In case the WB time, which was calculated by the usual WB measurement, exceeds specified rate compared with the stored WB time at shipment, errors occur.
*When the main PCB or parts of optical system are replaced, it is necessary to rewrite the WB data.

4. How to inspect

4-1. Start up the service software.

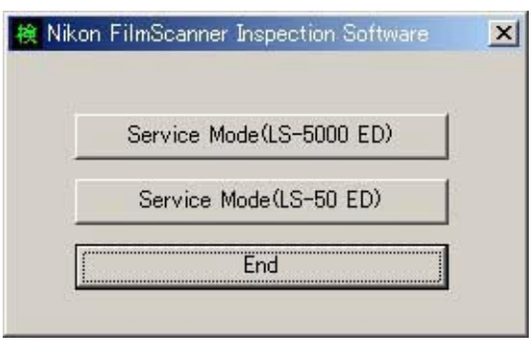
・Decompress the compressed file, and store the following 7 files in any folder.

・Connect LS-5000ED to PC and turn the power ON.

・Insert the adjustment and inspection glass chart (J61187).

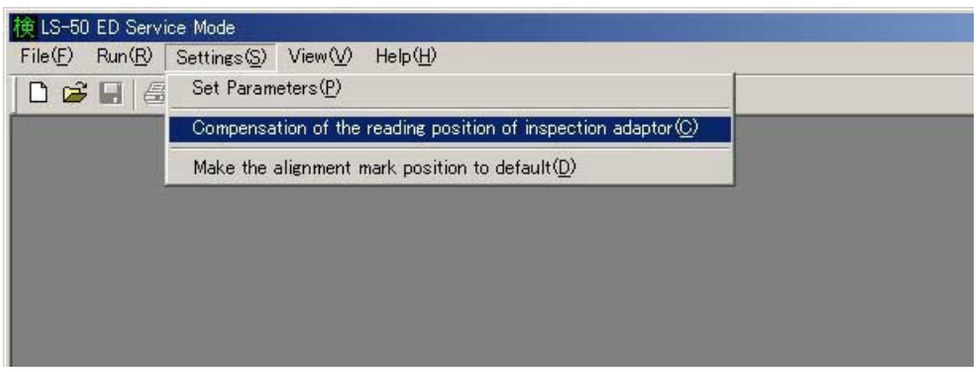
・Double-click the file "S10S05Sv.exe" to start the inspection software.

・Click "Service mode (LS-5000ED)" or "Service mode (LS-50ED)"

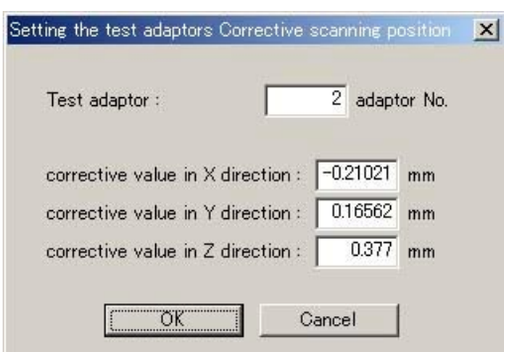


4-2. Input Compensation data of Inspection chart (J61187) into Inspection software

・Select "Setting" on the main menu, and choose "Compensation of the reading position of inspection adapter" from the pulldown menu.



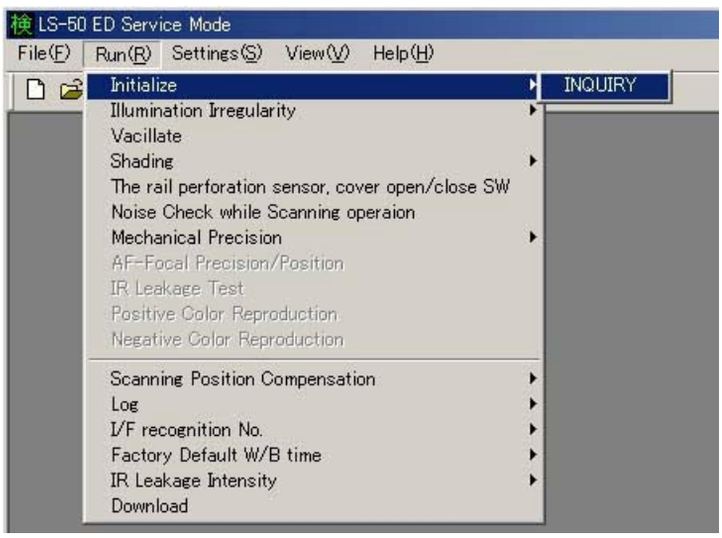
・Input "adapter No.", "corrective value in X direction", "corrective value in Y direction" and "corrective value in Z direction" that are attached on the inspection chart (J61187), then click "OK".



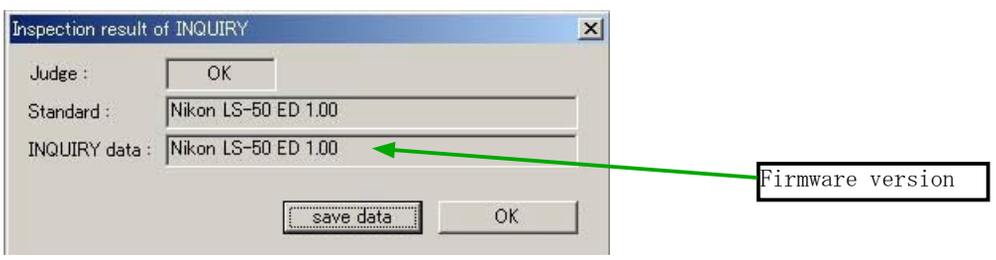
4-3. Procedure for inspection

1) Check the firmware version

Select "Run" on the main menu, then choose "Initialize" and "INQUIRY" from the pulldown menus, in order to check the firmware version.



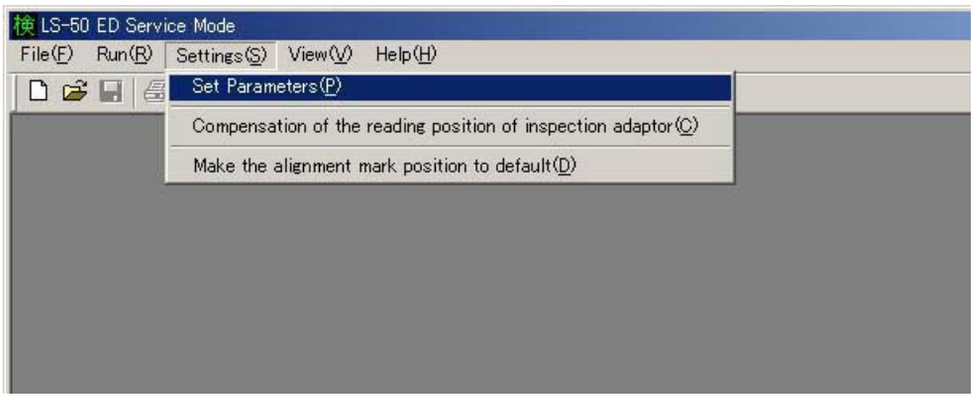
Click "OK" after the check.



Procedure for Firmware upgrading

① Save the firmware in any folder.

② Select "Setting" on the main menu, and choose "Set Parameters" from the pulldown menu.

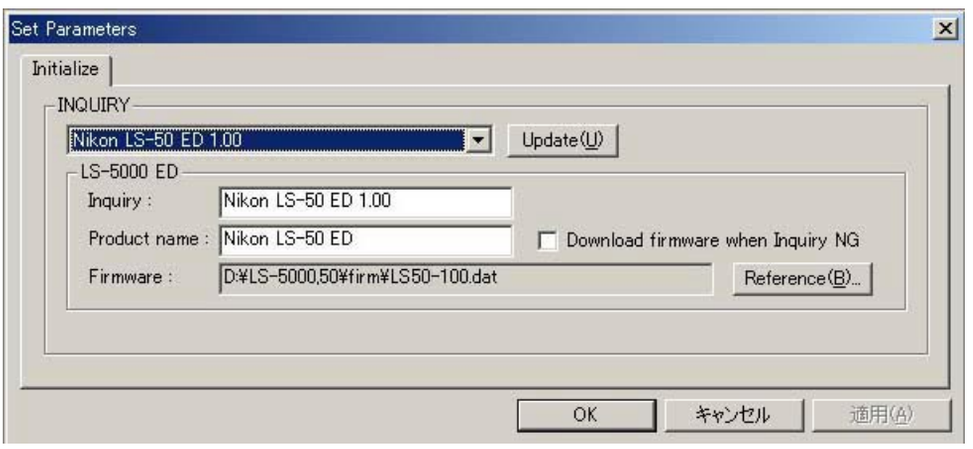


③ Click "Reference" to designate the folder where the firmware was saved in ① .

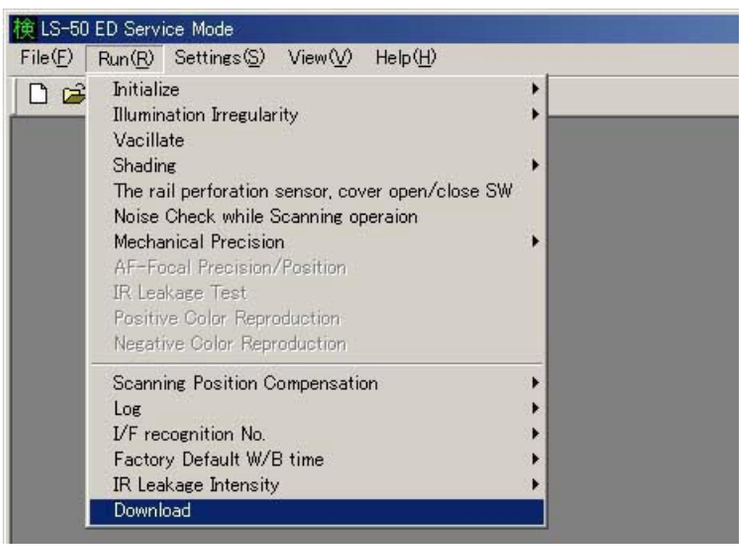
④ Write the firmware name in "Inquiry:".

⑤ Click "Apply".

⑥ Click "OK".

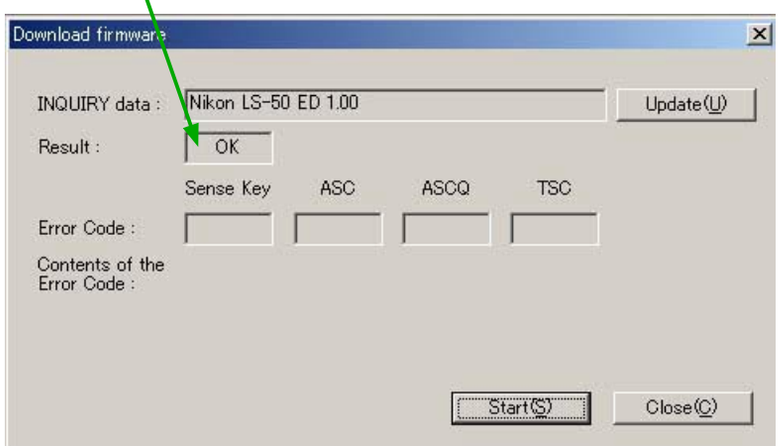


⑦ Select "Run" on the main menu, and choose "Download" from the pulldown menu.



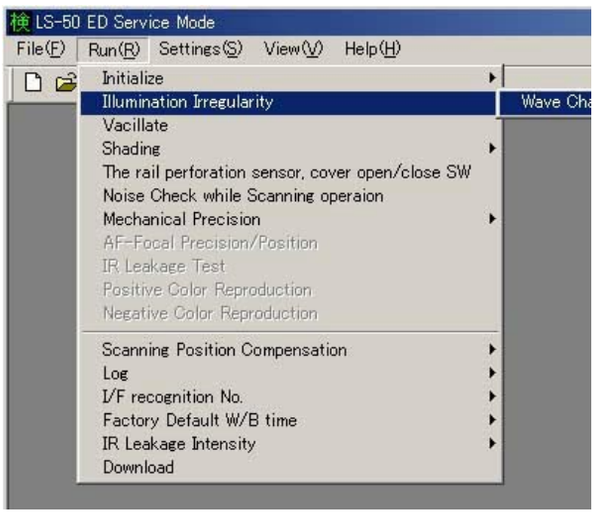
⑧ Click "Start" to upgrade the firmware.

⑨ When "OK" is displayed in"Result", the upgrading is completed.

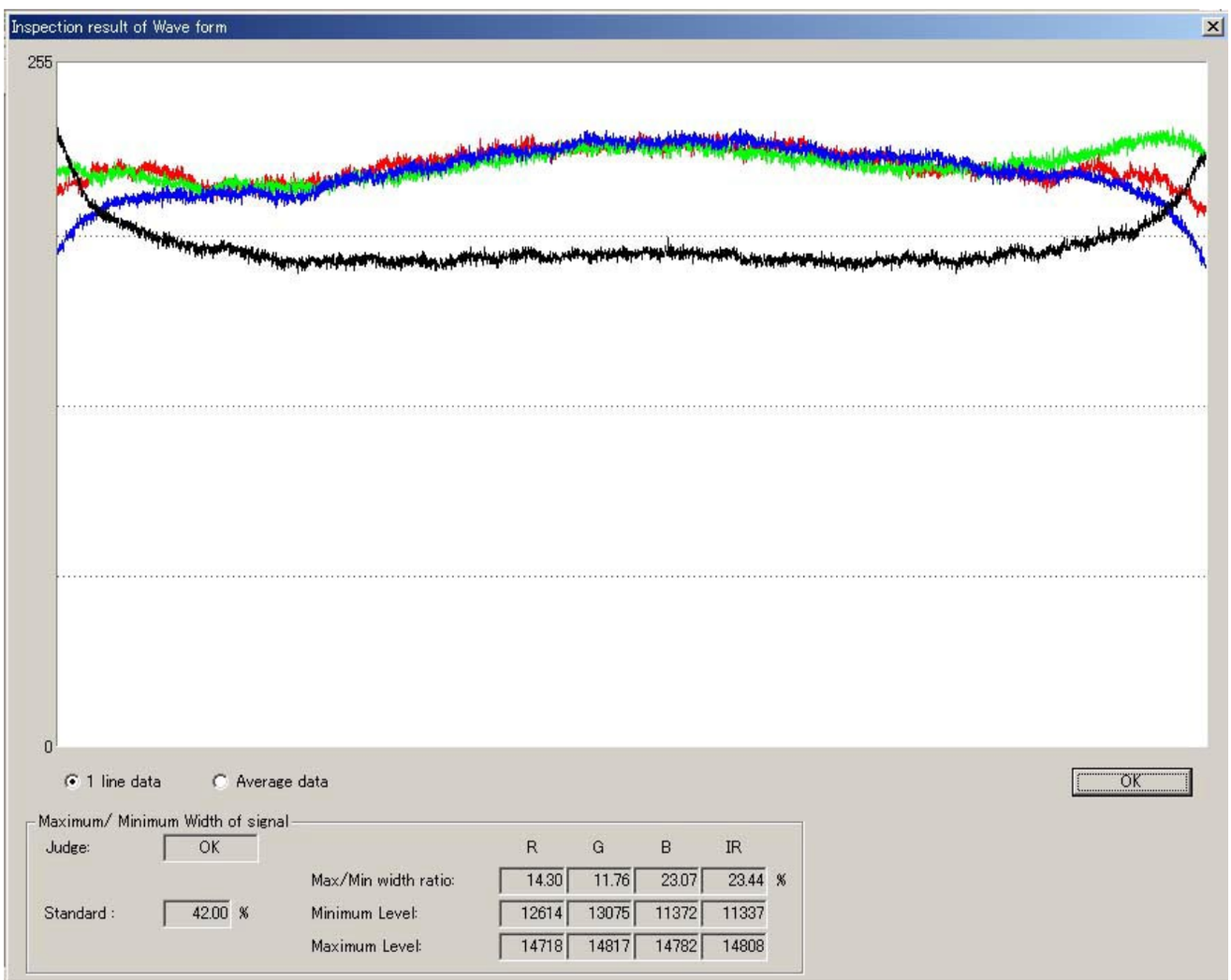


2) Illumination irregularity

・Select "Run" on the main menu and choose "Illumination Irregularity" from the pulldown menu.



・Check if there is no problem with R, G, B,I waveforms.



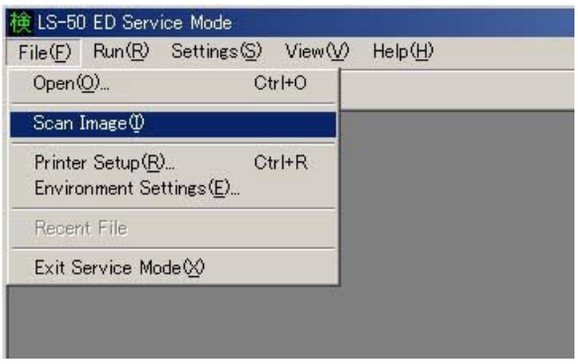
*Inspection result on Illumination irregularity

In the above screen, the CCD sensor addresses are allocated on the horizontal axis. If foreign matter such as dust enters between the LED illuminator and CCD sensor, the waveform of the address shifts significantly downward, so dust, etc, can be recognized by visual check. Illumination irregularity: Standard 42% or less.

In case of NG, clean the optical system.

3) Shading （check the shading ON data）

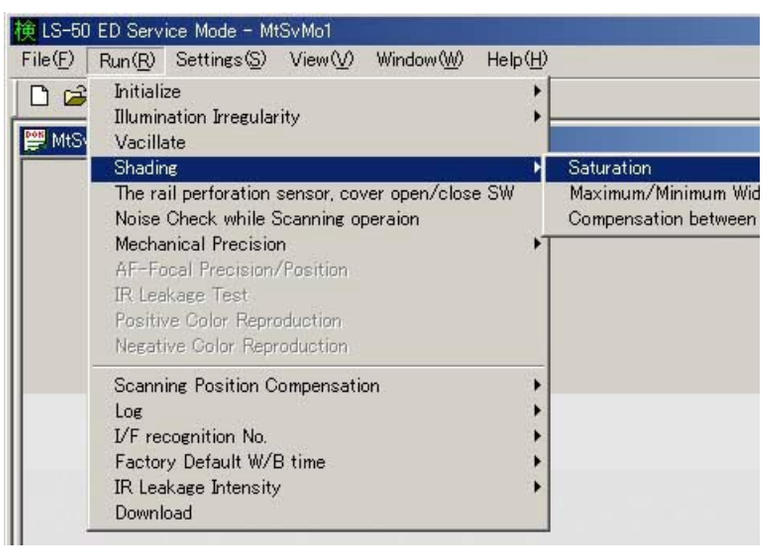
・Select "File" on the main menu and choose "Scan Image" from the pulldown menu.

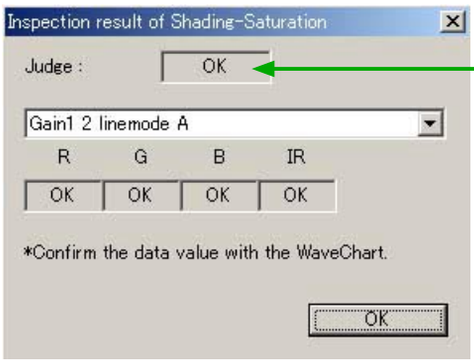


・In "Select the Chart", choose "No chart" and tick the box of "ON/OFF" of SD. Then click "OK".

・The scanning starts automatically.

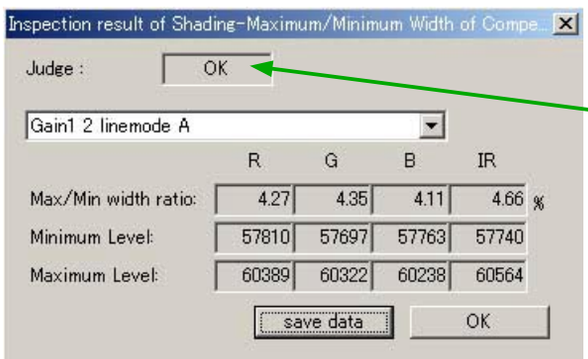
・Select "Run" on the main menu, then choose "Shading" and "Saturation" from the pulldown menus.





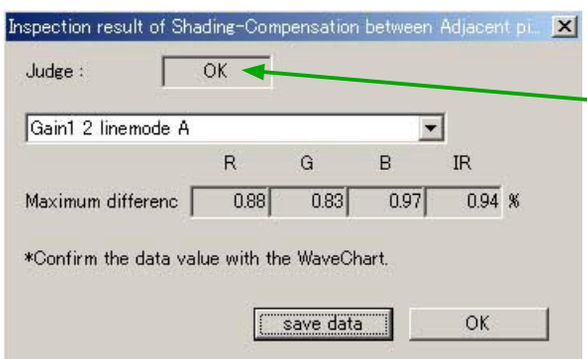
Inspection result on saturation

・Select "Run" on the main menu, then choose "Shading" and "Maximum/minimum width of compensation" from the pulldown menus.



Inspection result on saturation on Maximum/minimum width of compensation

・Select "Run" on the main menu, then choose "Shading" and "Compensation between Adjacent pixels" from the pulldown menus.



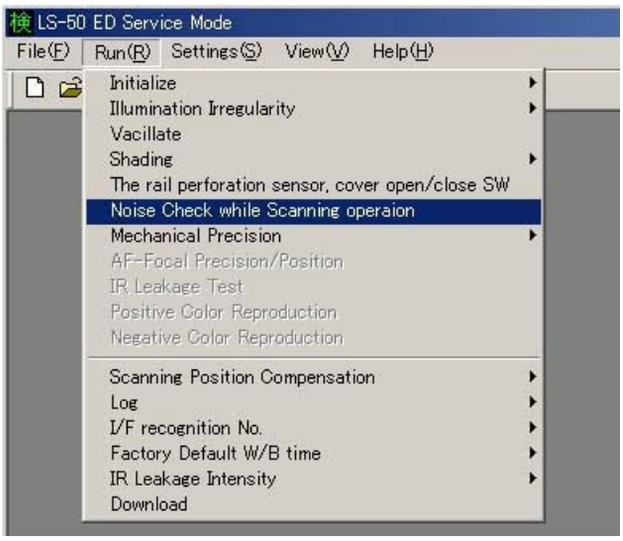
Inspection result on saturation on Compensation between adjacent pixels

In case of NG:

The shading ON data is compensated based on the "Illumination irregularity (Shading OFF)" to correct the CCD irregularity. If the inspection result is "NG", it is considered that the accuracy of "Illumination irregularity" is not within standard or there is problem with the shading compensation circuit on the main PCB. In the first case, clean the optical system and adjust the illumination irregularity, or replace the illumination LED unit. In the other case, replace the main PCB.

4) Noise inspection

・Select "Run" and choose "Noise Check While Scanning operation" from the pulldown menu.



・When "OK" is clicked, the scanning starts automatically. Check if there is no problem with the operating sounds during scanning.

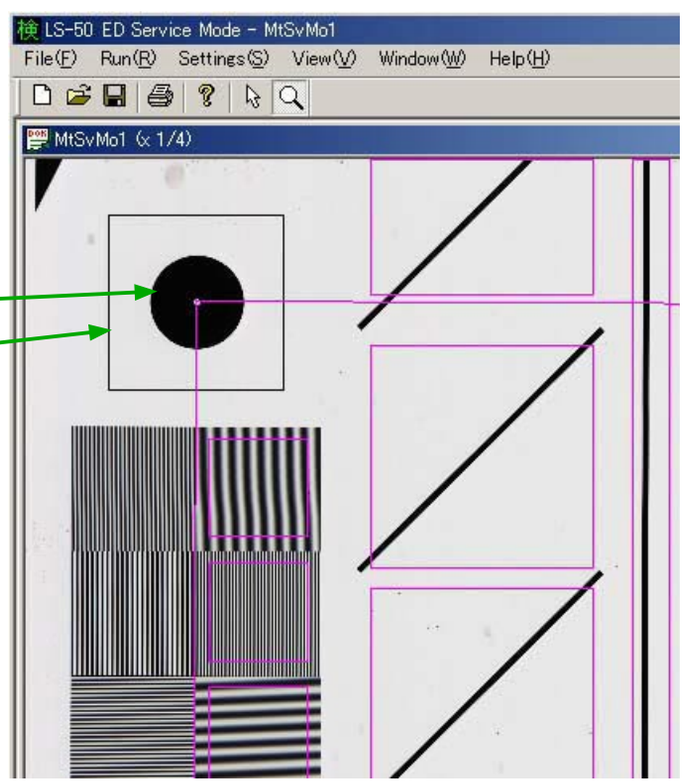
5) Mechanical precision inspection

・Select "File" on the main menu, and choose "Scan Image" from the pulldown menu. Then choose “Glass chart” and "4000dpi" for resolution . When "OK" is clicked, the scanning starts.

・When the scanned image of the chart is displayed on the monitor, drag the alignment detection frame (black square frame) at 4 corners with the mouse for adjustment so that the alignment mark (black circle) can be placed enough inside this frame.

The position that was adjusted once is automatically stored in the initial file. So unless the film slips significantly from the mount nor the scanning position of the scanner largely changes, it is NOT necessary to make an adjustment afterwards.

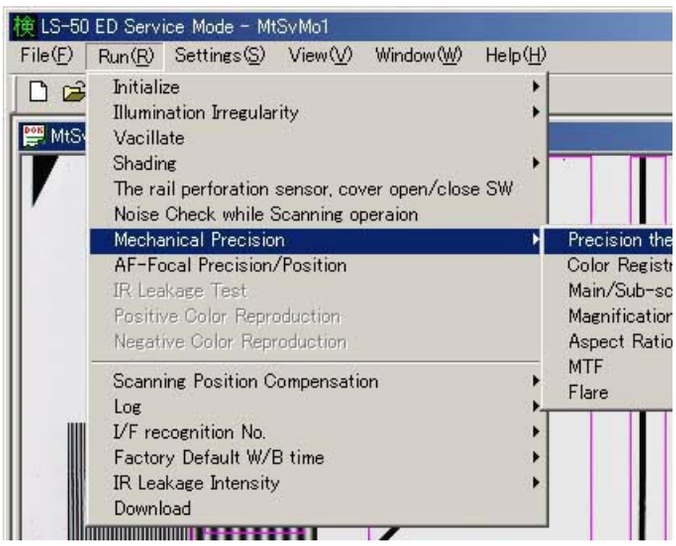
Adjust so that the alignment mark (black circle) can be placed enough inside the alignment detection frame (black square frame). Be sure to make this adjustment at 4 corners of the chart.



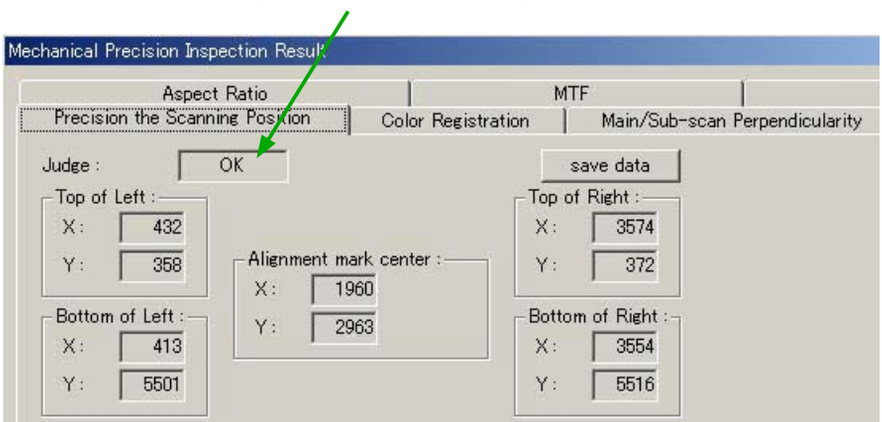
・Scanning position accuracy

Select "Run" on the main menu, then choose "Mechanical Precision Test" and "Precision the Scanning Position" from the pulldown menus.

In case of NG: Replace the mecha-block unit.



Inspection result on scanning position accuracy

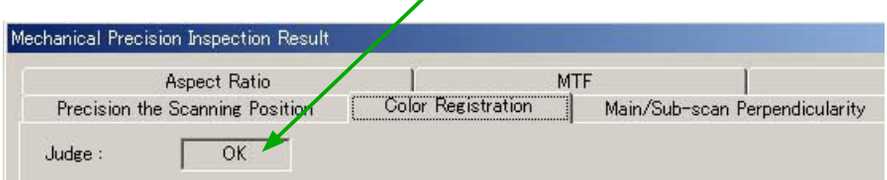


・Color registration

Select "Run" on the main menu, then choose "Mechanical Precision Test" and "Color Registration" from the pulldown menus.

In case of NG: Clean the optical system and clean/apply grease on the carriage advance mechanism, or replace the mecha-block unit.

Inspection result on color registration

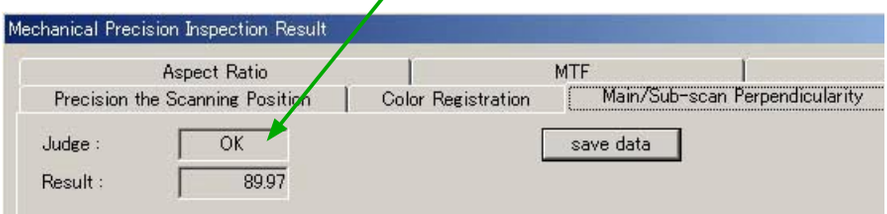


・Main/Sub-scan perpendicularity

Select "Run" on the main menu, then choose "Mechanical Precision Test" and "Main/Sub-scan Perpendicularity" from the pulldown menus.

In case of NG: Replace the mecha-block unit.

Inspection result on Main/Sub-scan perpendicularity

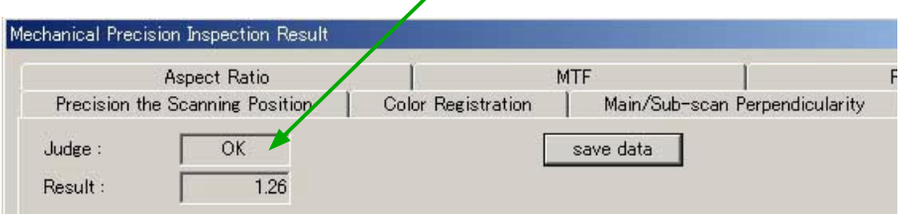


・Magnification of main scanning

Select "Run" on the main menu, then choose "Mechanical Precision Test" and "Magnification" from the pulldown menus.

In case of NG: Replace the mecha-block unit.

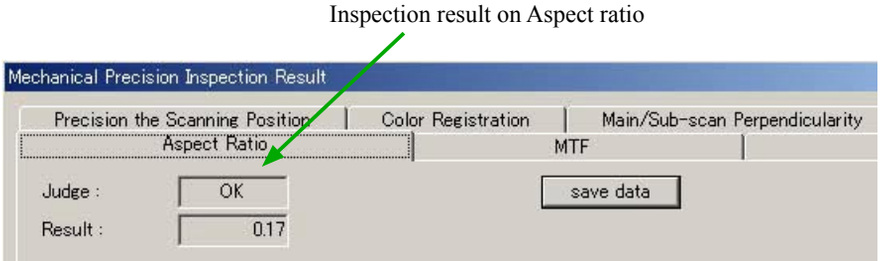
Inspection result on Magnification



・Aspect ratio

Select "Run" on the main menu, then choose "Mechanical Precision Test" and "Aspect Ratio" from the pulldown menus. In case of NG: Replace the mecha-block unit.

Inspection result on Aspect ratio

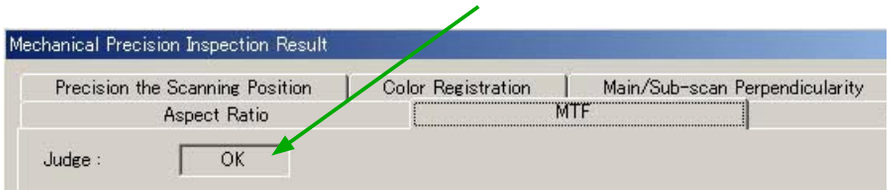


・MTF

Select "Run" on the main menu, then choose "Mechanical Precision Test" and "MTF" from the pulldown menus.

In case of NG: Clean/apply grease on the AF mechanism unit and clean the optical system, or replace the mecha-block unit.

Inspection result on MTF

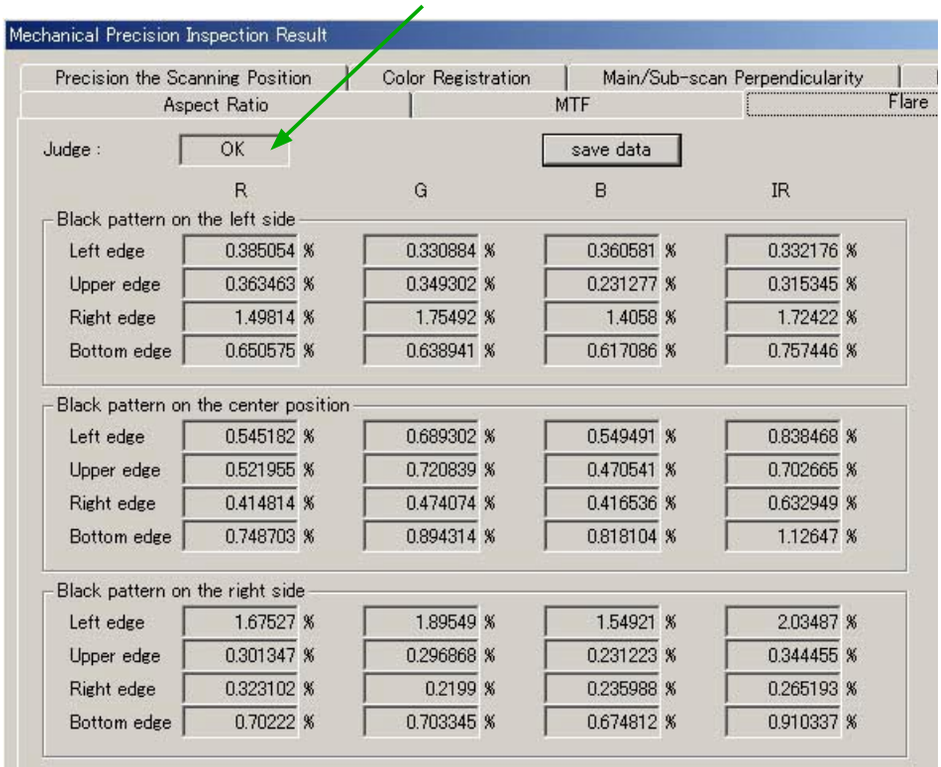


・Flare

Select "Run" on the main menu, then choose "Mechanical Precision Test" and "Flare" from the pulldown menus.

In case of NG: Clean the optical system and inspect the AF mechanism unit.

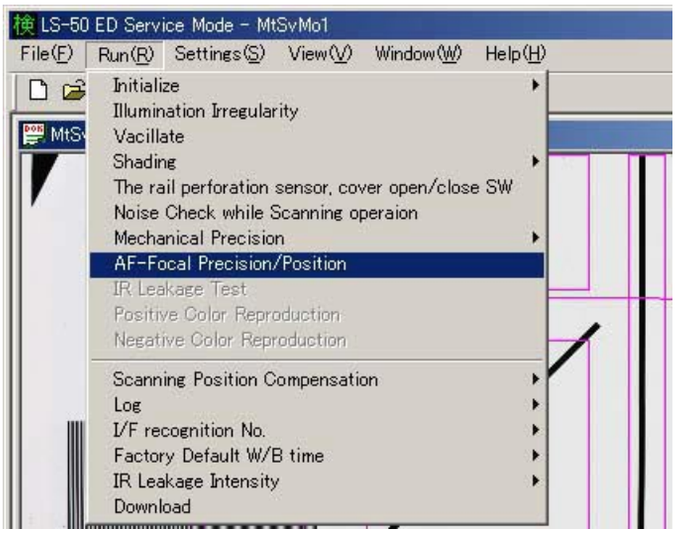
Inspection result on Flare



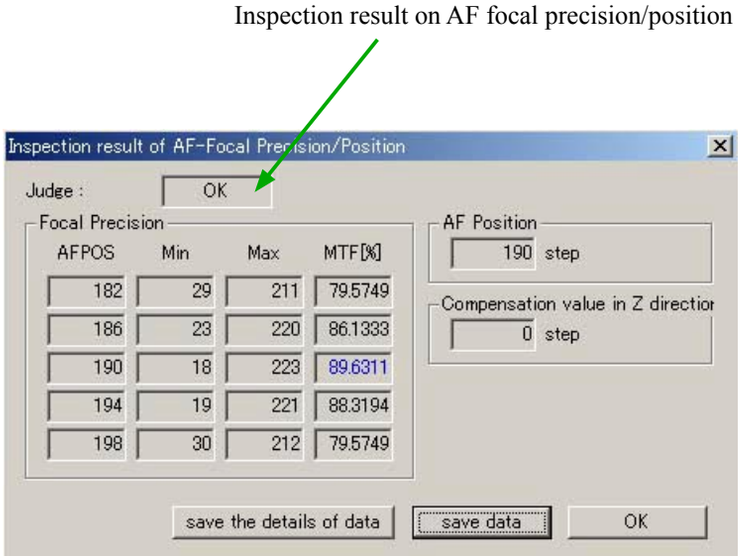
・Inspection on AF focal precision/position

Select "Run" on the main menu, and choose "AF-Focal Precision/Position" from the pulldown menu. Then, the AF operates automatically.

In case of NG: Clean the optical system and inspect the AF mechanism unit.



Inspection result on AF focal precision/position

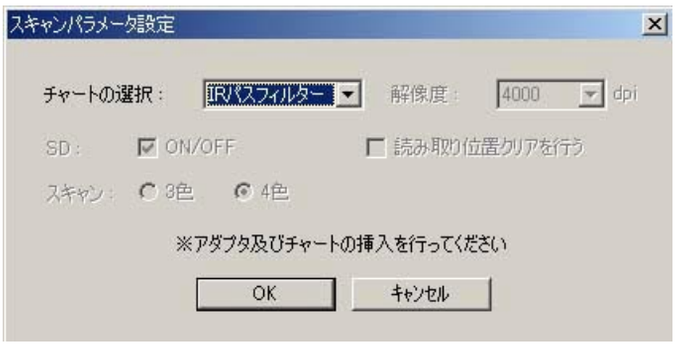


6) IR pass filter

・Take out the inspection chart (J61187) from the scanner.

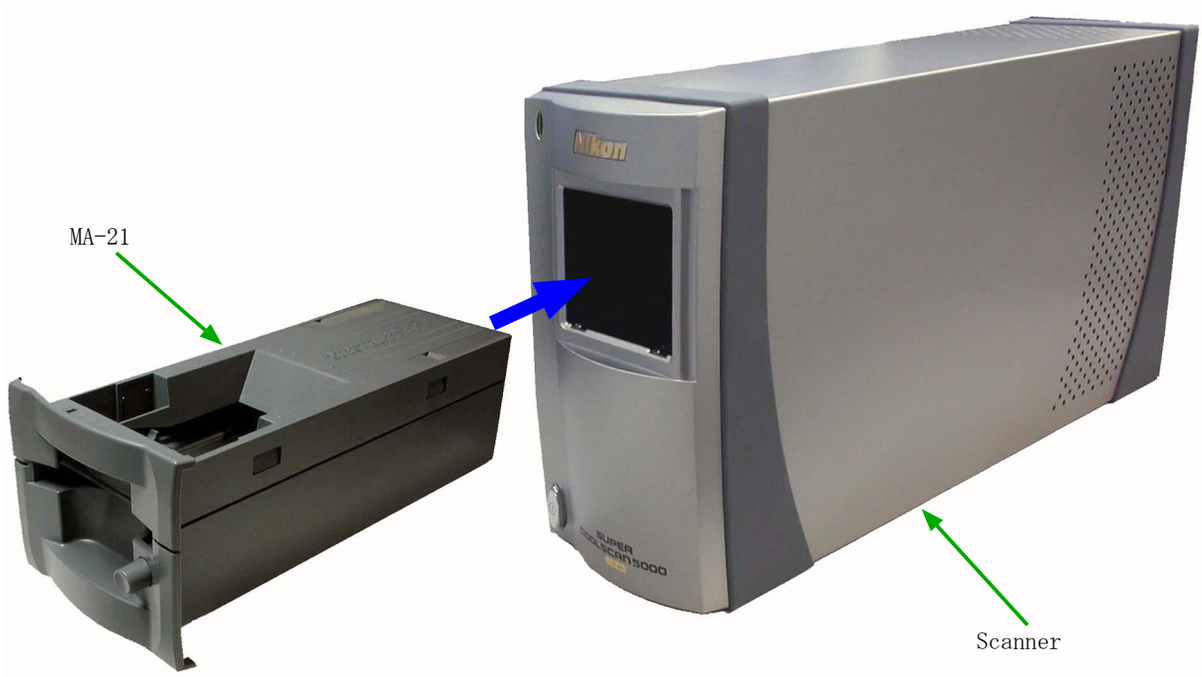
・Select "File" on the main menu and choose "Scan Image" from the pulldown menu. Then select "IR Pass Filter" and click "OK".

※ Do NOT insert MA021 and IR pass filter (J63088) yet.

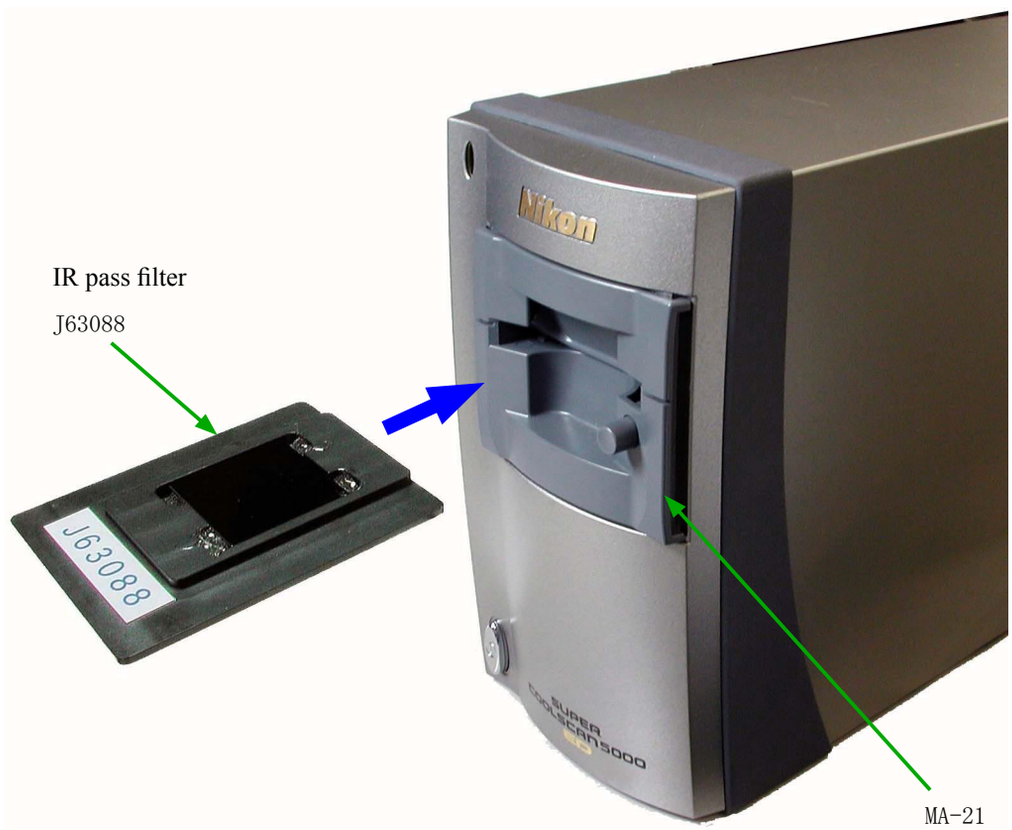


・When the following message is indicated, insert MA-21 into the scanner. Then wait until the green LED changes from blinking to lightening (for about 30 seconds), and click "OK".

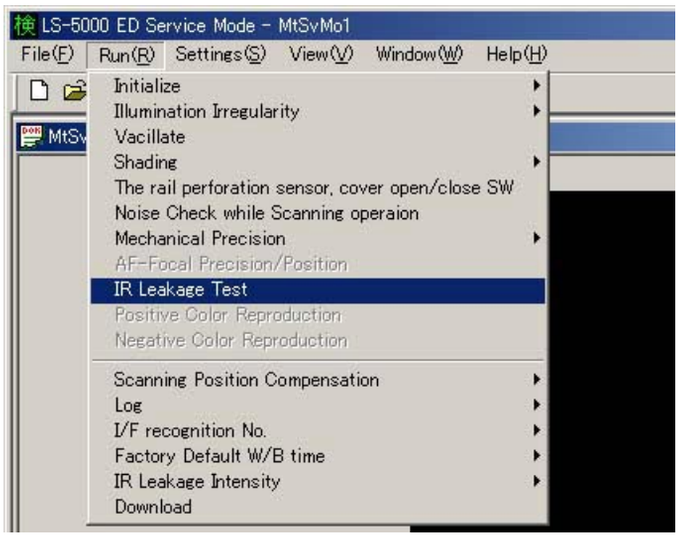
※ Do NOT insert IR pass filter (J63088) yet.



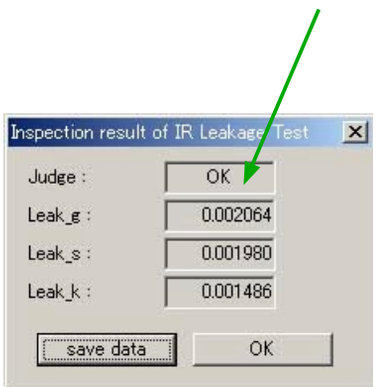
・When the following message is indicated, insert IR pass filter (J63088) into MA-21. When "OK" is clicked, the scanning starts.



・Select "Run" on the main menu, and "IR Leakage Test" (IR pass filter) from the pulldown menu.
In case of NG: LED malfunction should be considered.



Inspection result on IR pass filter

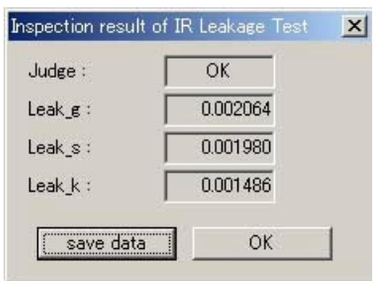


※ Make an inspection whenever the main PCB or parts of the optical system are replaced.
After replacing the parts, perform the above "IR Leakage Test" (IR pass filter). Record each data of inspection result (Leak_g・Leak_s・Leak_k), then rewrite the compensation data according to the instruction of the next page.

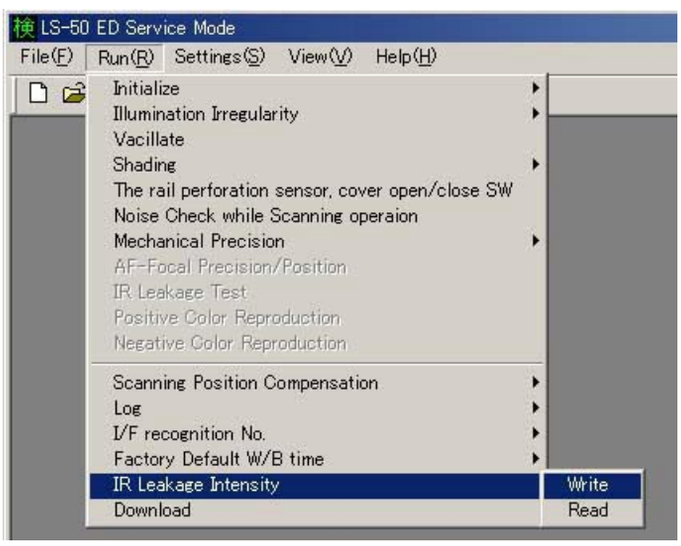
Rewrite IR pass filter compensation data

※ When the main PCB or parts of optical system are replaced, rewrite the compensation data according to the following instrucition.

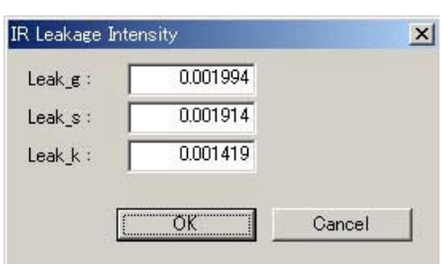
① After replacing parts, perform "IR Leakage Test" (IR pass filter) from page A17 to A19. Record each data on inspection results (Leak_g・Leak_s・Leak_k).



② Select "Run" on the main menu, then choose "IR Leakage Intensity" and "Write" from the pulldown menus.



③ Input each data (Leak_g・Leak_s・Leak_k) that was recorded in ①, then click "OK".

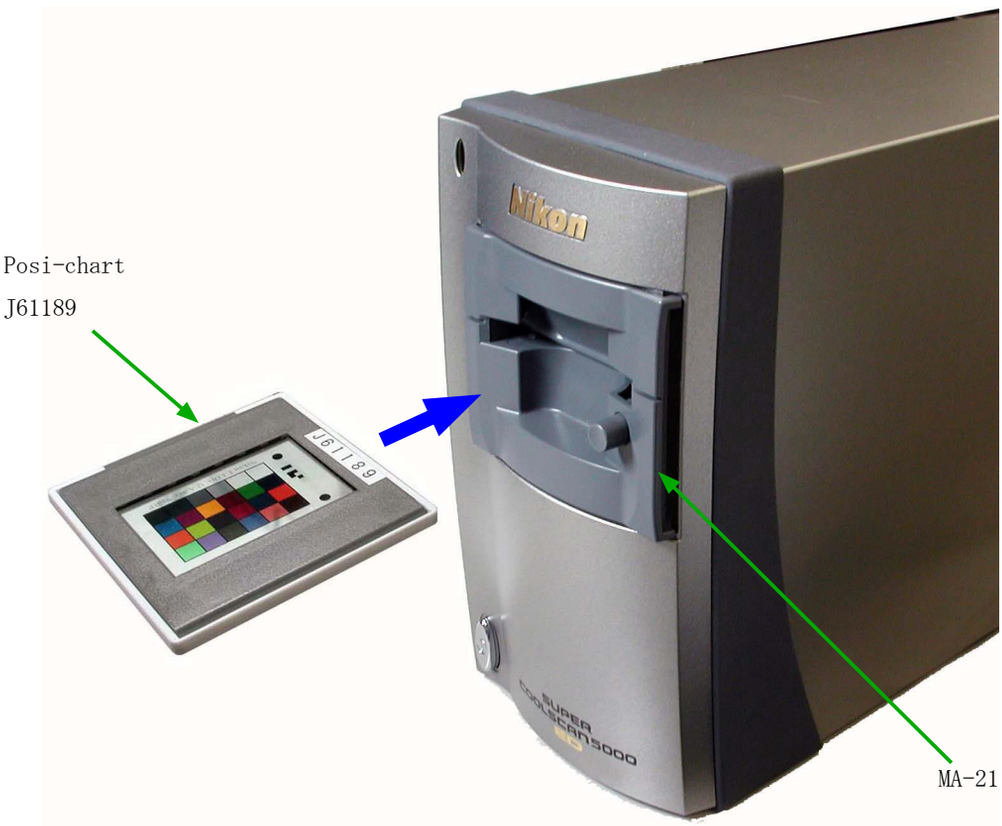


③ Click "OK".

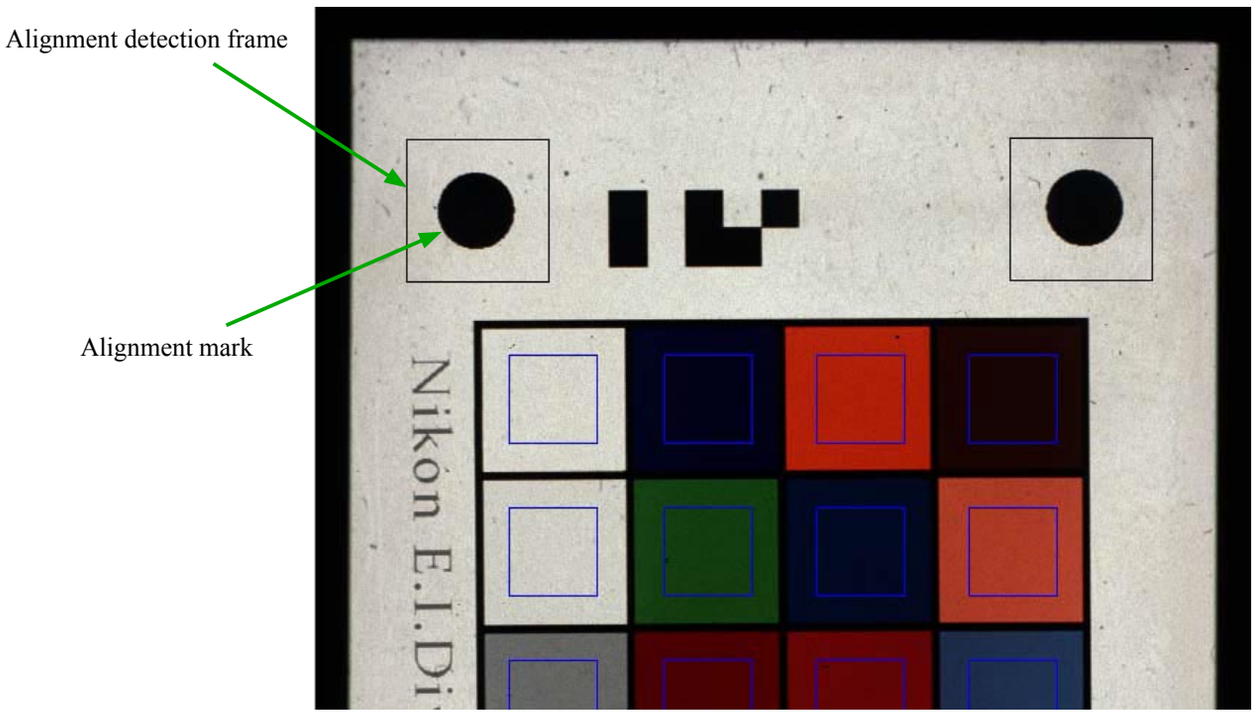
④ After completing writing, click "OK" to go back to the main menu.

7) Color reproduction (positive)

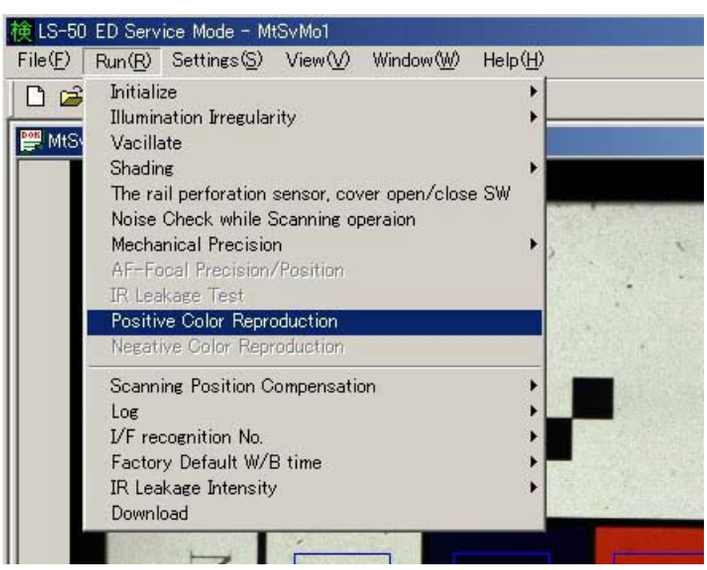
- Take out the inspection chart (J61187) from the scanner.
- Insert MA-21 into the scanner.
- Insert the posi-chart (J61189) and check if the green LED changes from blinking to lightening.
- Select "File" on the main menu, and "Scan Image" from the pulldown menu. Then, choose "Posi-Chart" and click "OK" the scanning starts automatically.



・When the scanned image is displayed on the monitor, drag the alignment detection frame (black square frame) with the mouse for adjustment so that the alignment mark (black circle) can be placed enough inside this frame.（Adjust the both right and left alignment marks.



・Select "Run" on the main menu, and "Positive Color Reproduction" from the pulldown menu.
In case of NG: Clean the posi-chart and inspect the optical system.



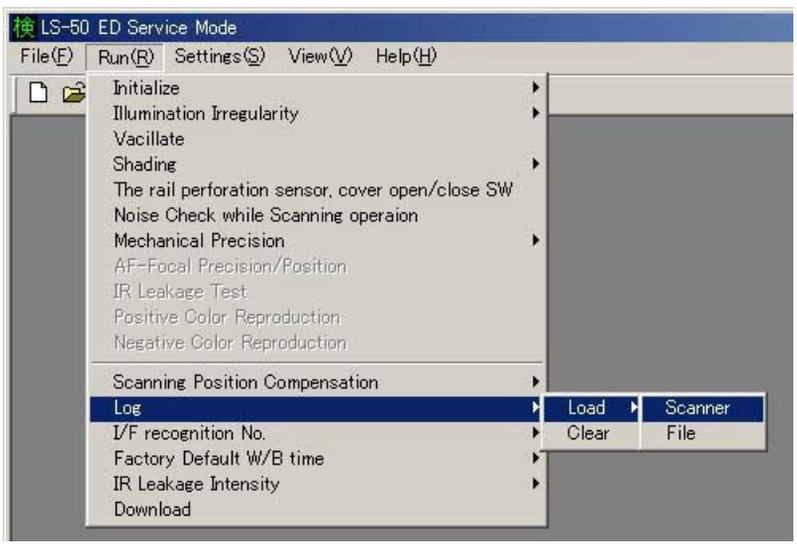
Inspection result on Positive color reproduction

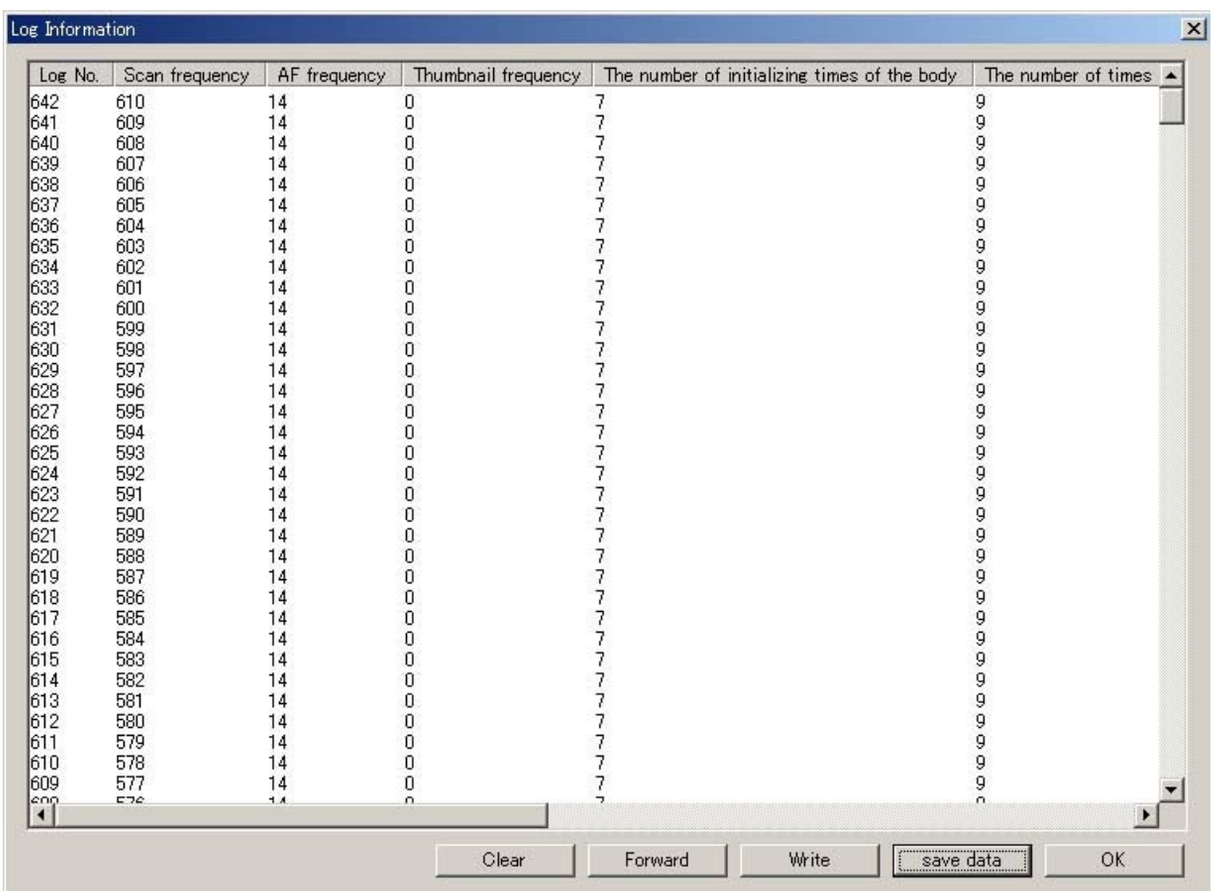
8) Log

・Select "Run" on the main menu, then choose "Log", "Load" and "Scanner". The log data is automatically indicated.

・When "Run", "Log", "Load" and "File" are selected, the saved log data on PC is called up.

・When "Run", "Log" and "Clear" are selected, the log data in the flash memory on the main PCB is cleared.





Clear - - -The log data in the flash memory on the main PCB is cleared/deleted.

Write- - -The saved log data is written in the flash memory.

Save - - -The log data is saved on PC.

9) WB time

・Select "Run" on the main menu, then choose "Factory Default W/B time" (WB time) and "Write Auto" or "Write" or "Read" from the pulldown menus.

Write Auto: The current WB data is written in the flash memory of the main PCB.

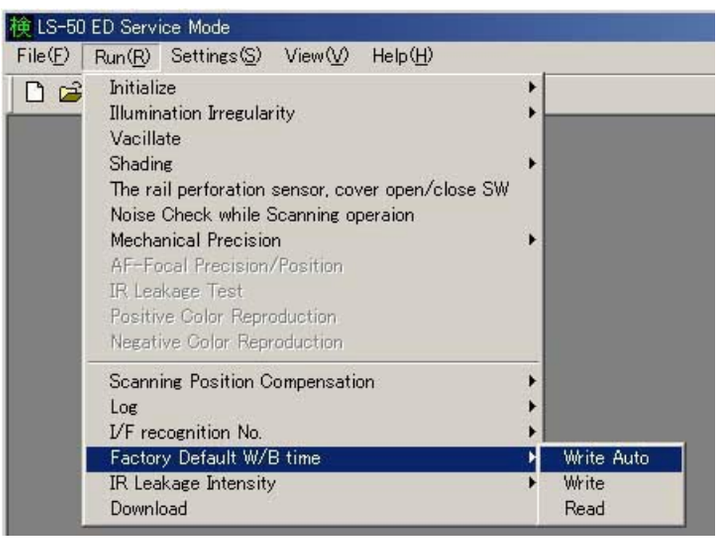
※ Initialize WB data when the LED is replaced or parts of optical system is cleaned.

Write: The WB data is written.

※ When the main PCB unit is replaced, be sure to perform "Read" before the replacement, and make note of values of WB data. Then after the replacement, write the noted values.

Read: The WB data that was written in the flash memory is read.

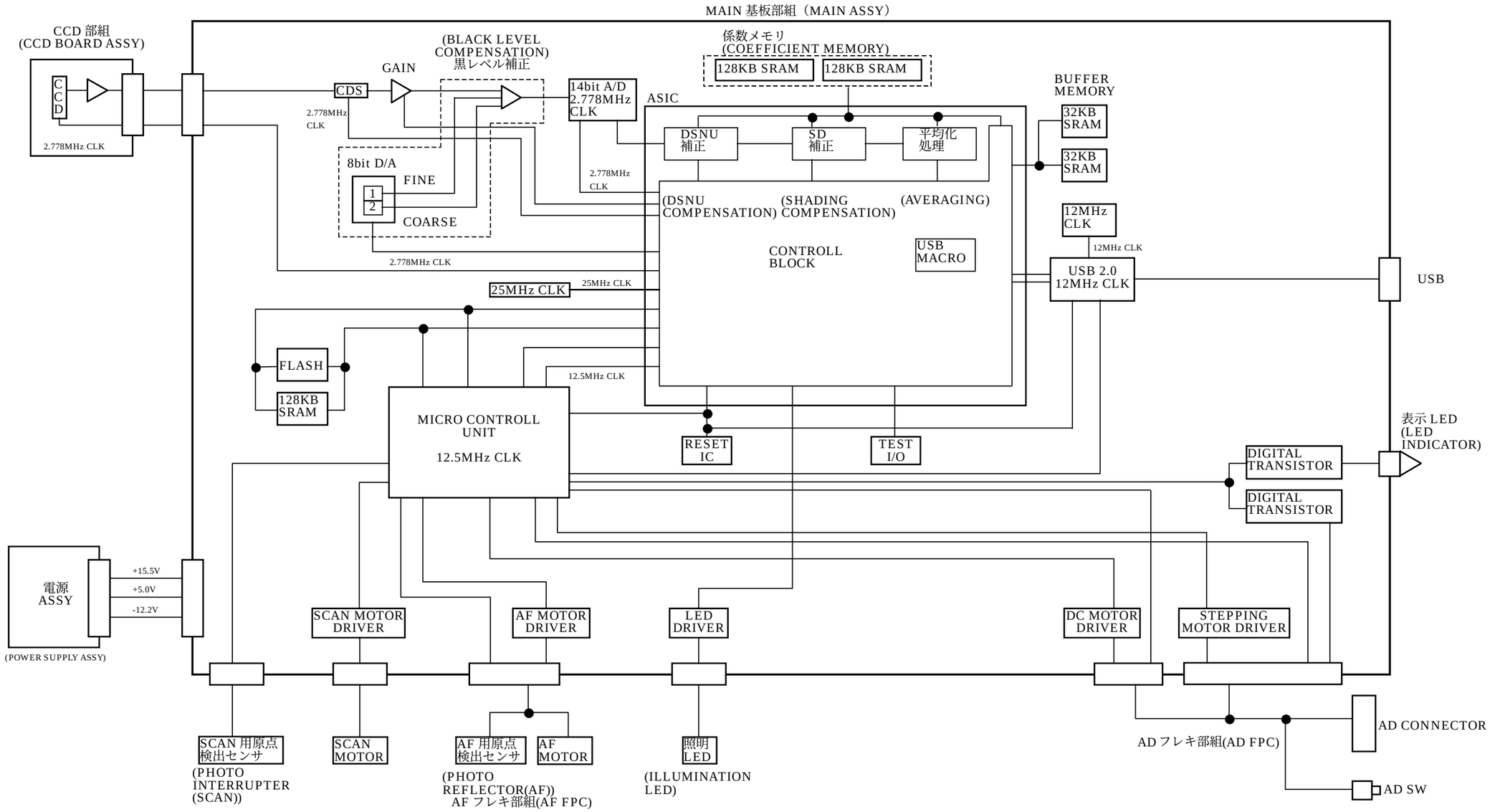
(i.e. WB data at shipment or when the LED is replaced for repairs or when the optical system is cleaned.)



ELECTRIC CONTENTS

BLOCK DIAGRAM …… E1
WIRING …… E2
MAIN PCB 1 …… E3
MAIN PCB 2 …… E4
MAIN PCB 3 …… E5
MAIN PCB 4 …… E6
MAIN PCB 5 …… E7

ブロック図　BLOCK DIAGRAM



配線図
WIRING

#1005 power supply cable
#1005
電源ハーネス

CN501
#1004
電源ASSY
#1004 power supply assy
CN102-1-+5V 1
CN102-2-+5V 2
CN102-3-GND 3
CN102-4-GND 4
CN102-5-−12V 5
CN102-6-GND 6
CN102-7-GND 7
CN102-8-+15V 8

CN102
1 CN501-1-+5V
2 CN501-2-+5V
3 CN501-3-GND
4 CN501-4-GND
5 CN501-5-−12V
6 CN501-6-GND
7 CN501-7-GND
8 CN501-8-+15V

#1001
MAIN基板部組（S0005）
Main PCB assy (S0005)

CN108
Scan motor 1-A 1 SCANモータ-1-A
Scan motor 2-_A 2 SCANモータ-2-_A
Scan motor 3-B 3 SCANモータ-3-B
Scan motor 4-_B 4 SCANモータ-4-_B

1 CN108-1-A
2 CN108-2-_A
3 CN108-3-B
4 CN108-4-_B

#110-1
SCANモータ
Scan motor

#110
スキャンモータ部組
Scan motor assy

CN105
AF FPC assy-1-A 1 AFフレキ部組-1-A
AF FPC assy-2-A/ 2 AFフレキ部組-2-A/
AF FPC assy-3-B/ 3 AFフレキ部組-3-B/
AF FPC assy-4-B 4 AFフレキ部組-4-B
AF FPC assy-5-Tr_C 5 AFフレキ部組-5-Tr_C
AF FPC assy-6-LED_C 6 AFフレキ部組-6-LED_C
AF FPC assy-7-LED_A 7 AFフレキ部組-7-LED_A
AF FPC assy-8-Tr_E 8 AFフレキ部組-8-Tr_E

1 CN105-1-A
2 CN105-2-A/
3 CN105-3-B/
4 CN105-4-B
5 CN105-5-Tr_C
6 CN105-6-LED_C
7 CN105-7-LED_A
8 CN105-8-Tr_E

#101-15-1
AFフレキ部組
AF FPC assy

#101-15
AF部組
AF assy

CN103
LED block assy-1-COM 1 LEDブロック部組-1-COM
LED block assy-2-LEDR 2 LEDブロック部組-2-LEDR
LED block assy-3-LEDI 3 LEDブロック部組-3-LEDI
LED block assy-4-LEDB 4 LEDブロック部組-4-LEDB
LED block assy-5-LEDG 5 LEDブロック部組-5-LEDG

1 CN103-1-COM
2 CN103-2-LEDR
3 CN103-3-LEDI
4 CN103-4-LEDB
5 CN103-5-LEDG

#101-21-5
LEDブロック部組
LED block assy

#101-21
照明ベース部組
Illumination base assy

#101
メカブロック部組
（S0005）
Mecha block assy (S0005)

CN101
CN201-1-ROG 1
CN201-2-CKCCD1 2
CN201-3-CKCCD2 3
CN201-4-EXRS 4
CN201-5-AGND 5
CN201-6-AGND 6
CN201-7-−3V 7
CN201-8-−3V 8
CN201-9-+12V 9
CN201-10-+12V 10
CN201-11-AGND 11
CN201-12-AIN 12
CN201-13-AIN 13
CN201-14-AGND 14

CN201
1 CN101-1-ROG
2 CN101-2-CKCCD1
3 CN101-3-CKCCD2
4 CN101-4-EXRS
5 CN101-5-AGND
6 CN101-6-AGND
7 CN101-7-−3V
8 CN101-8-−3V
9 CN101-9-+12V
10 CN101-10-+12V
11 CN101-11-AGND
12 CN101-12-AIN
13 CN101-13-AIN
14 CN101-14-AGND

#101-29
CCD部組（S0005）
CCD boad assy (S0005)

Photo-interrupter harness
#1006
フォトインタラプタハーネス

CN104
CN401-1-Vcc 1
CN401-2-SCAN 2
CN401-3-GND 3

CN401
1 CN104-1-Vcc
2 CN104-2-SCAN
3 CN104-3-GND

#1013
フォトインタラプタ
Photo-interrupter

USB2.0

CN109
1 Vbus
2 D−
3 D+
4 GND
5 SHLD
6 SHLD

CN107
1 CN301-32-+15V
2 CN301-33-MT3_A
3 CN301-34-MT3_B
4 CN301-22-MT3_A/
5 CN301-12-MT3_B/
6 CN301-11-MSW8
7 CN301-10-MSW17
8 CN301-21-MSW7
9 CN301-9-MSW16
10 CN301-20-MSW14
11 CN301-8-MSW4
12 CN301-19-MSW3
13 CN301-7-MSW2
14 CN301-18-MSW5
15 CN301-6-MSW6
16 CN301-17-MSW11
17 CN301-5-MSW10
18 CN301-16-MSW9
19 CN301-4-M-HSIG2
20 CN301-15-M-HSIG1
21 CN301-3-M-WSIG2
22 CN301-14-M-WSIG1
23 CN301-2-LED2
24 CN301-1-LED1
25 CN301-13-MGND
26 CN301-23-M+5V

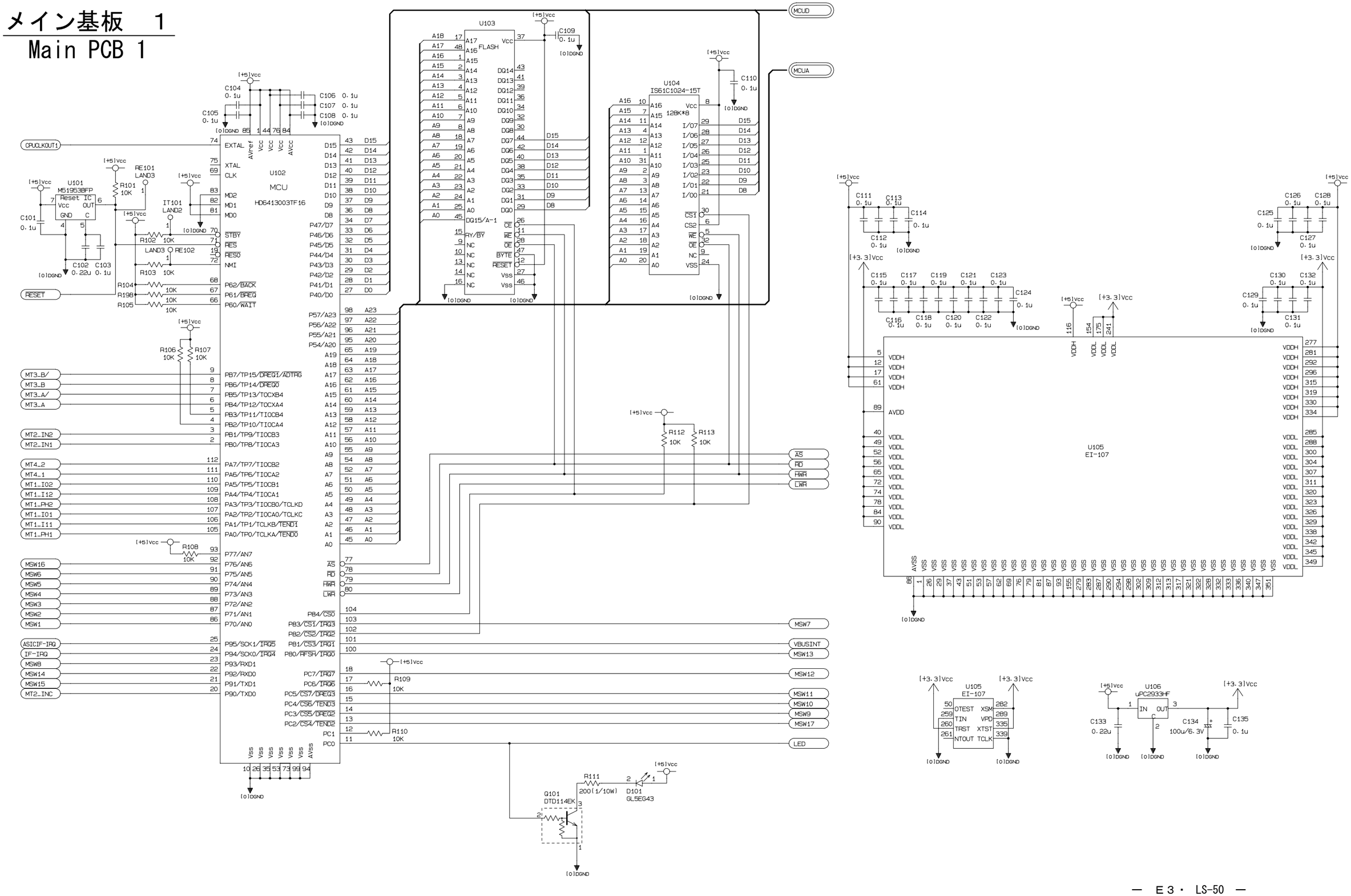
CN106
1 CN301-24-MAGND
2 CN301-24-MAGND
3 CN301-25-M+15V
4 CN301-25-M+15V
5 CN301-26-+5V
6 CN301-27-DGND
7 CN301-28-MT4_1
8 CN301-28-MT4_1
9 CN301-28-MT4_1
10 CN301-29-MT4_2
11 CN301-29-MT4_2
12 CN301-29-MT4_2
13 CN301-30-MT5_1
14 CN301-31-MT5_2
15 SW301-NO-ADH5V
16 SW301-COM-AD

#1009
ADフレキ部組

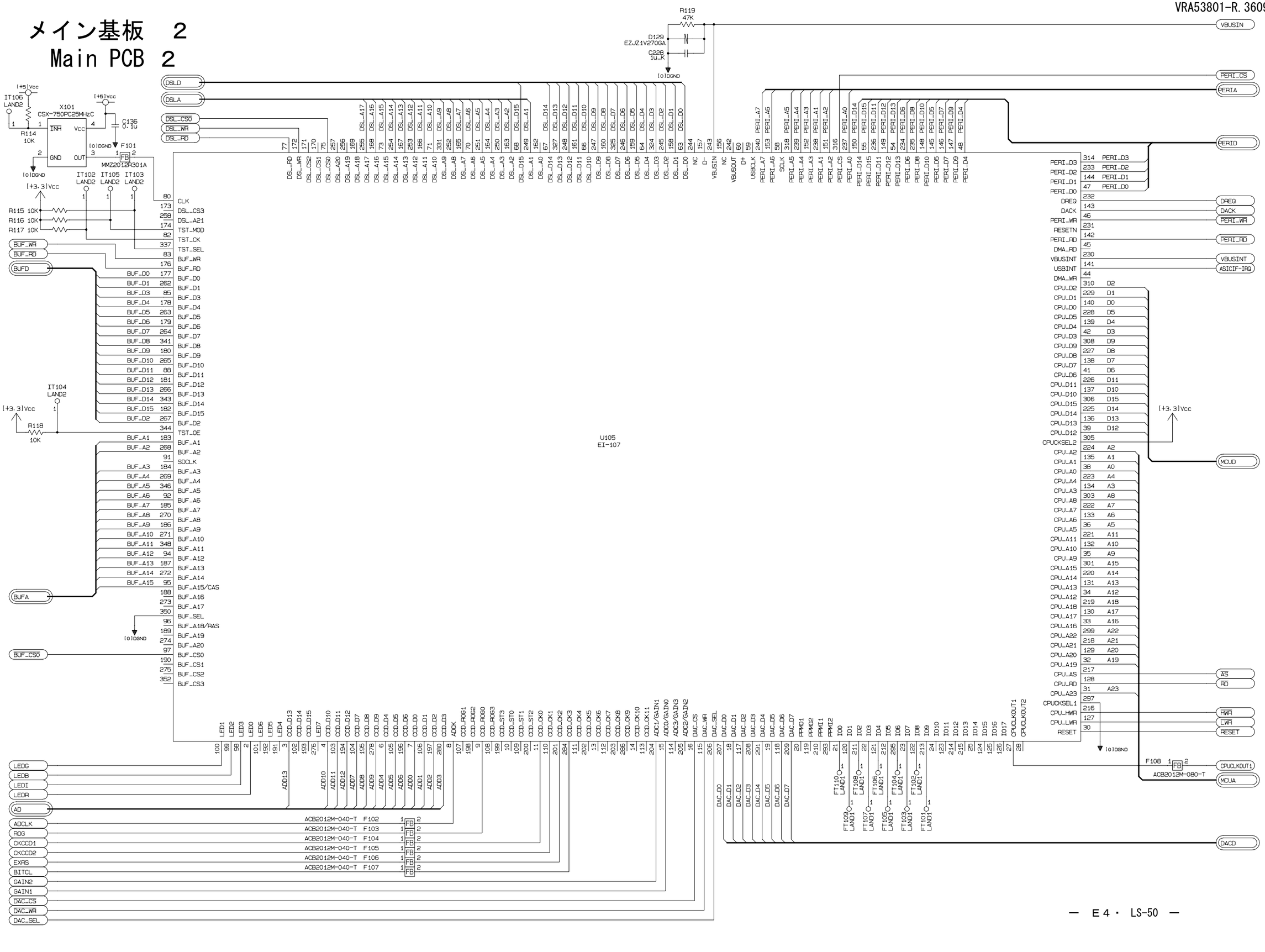
CN301
32 CN107-1-+15V
33 CN107-2-MT3_A
34 CN107-3-MT3_B
22 CN107-4-MT3_A/
12 CN107-5-MT3_B/
11 CN107-6-MSW8
10 CN107-7-MSW17
21 CN107-8-MSW7
9 CN107-9-MSW16
20 CN107-10-MSW14
8 CN107-11-MSW4
19 CN107-12-MSW3
7 CN107-13-MSW2
18 CN107-14-MSW5
6 CN107-15-MSW6
17 CN107-16-MSW11
5 CN107-17-MSW10
16 CN107-18-MSW9
4 CN107-19-M-HSIG2
15 CN107-20-M-HSIG1
3 CN107-21-M-WSIG2
14 CN107-22-M-WSIG1
2 CN107-23-LED2
1 CN107-24-LED1
13 CN107-25-MGND
23 CN107-26-M+15V
24 CN106-1.2-MAGND
25 CN106-3.4-M+15V
26 CN106-5-+5V
27 CN106-6-DGND
28 CN106-7.8.9-MT4_1
29 CN106-10.11.12-MT4_2
30 CN106-13-MT5_1
31 CN106-14-MT5_2

SW301
NO CN106-15-ADH5V
COM CN106-16-AD
NC NC

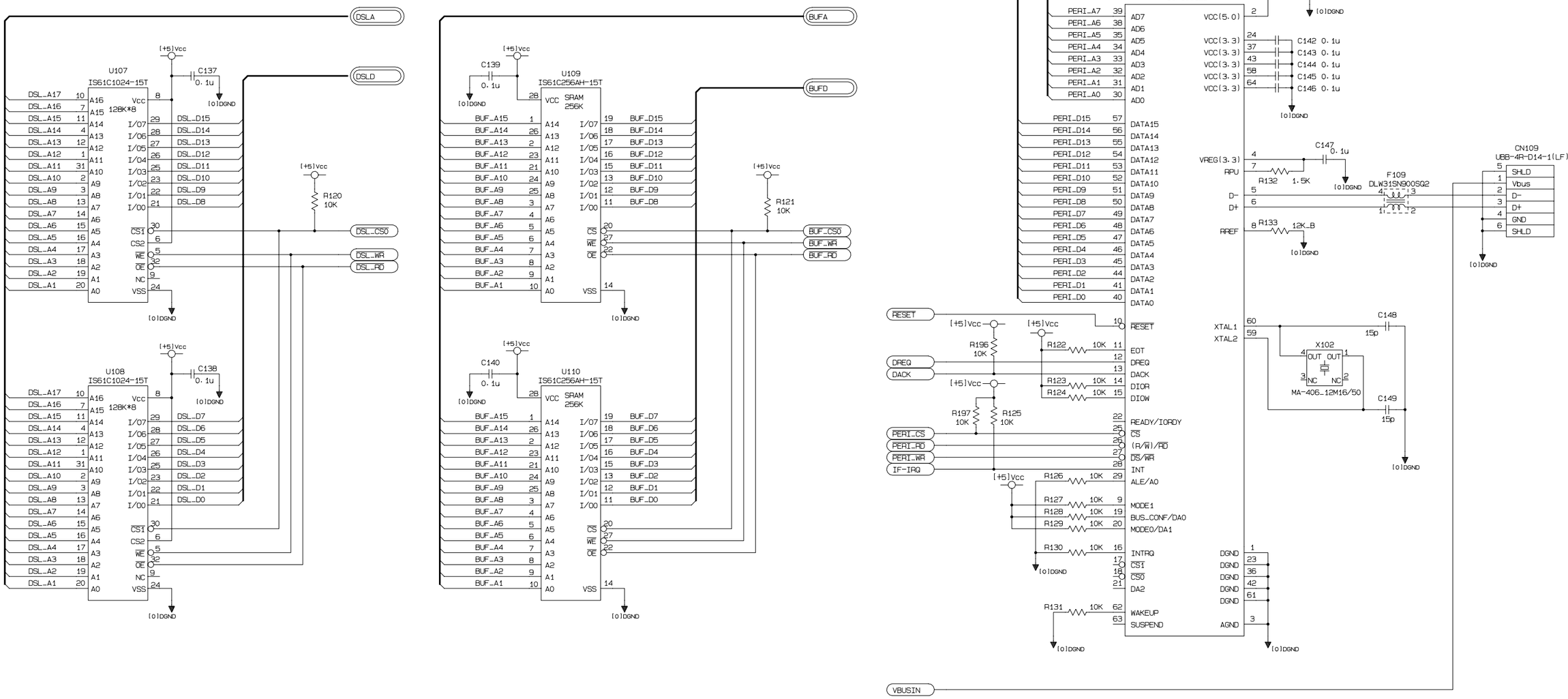
メイン基板　1
Main PCB 1



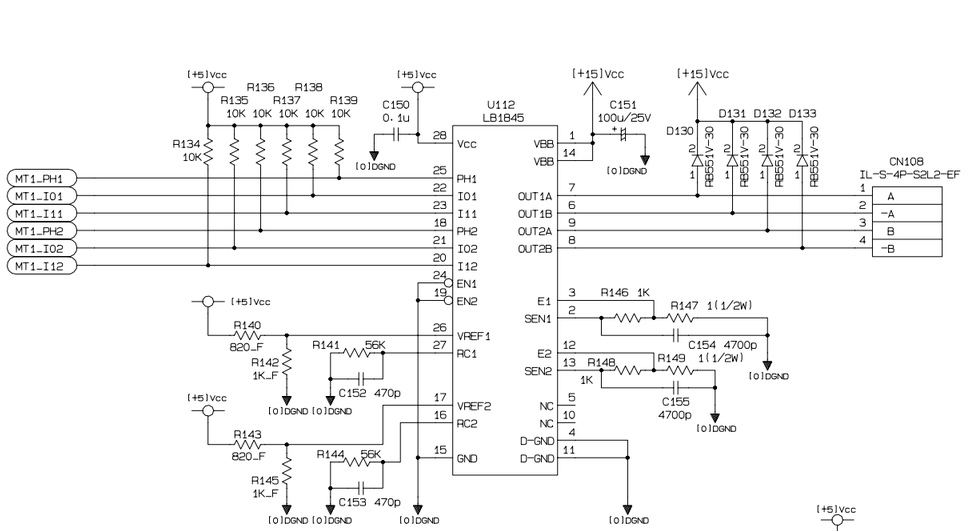
メイン基板　2
Main PCB 2

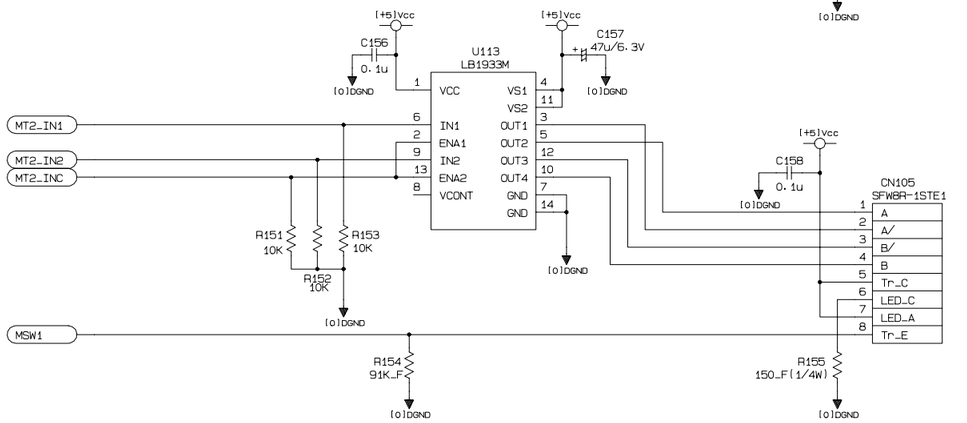


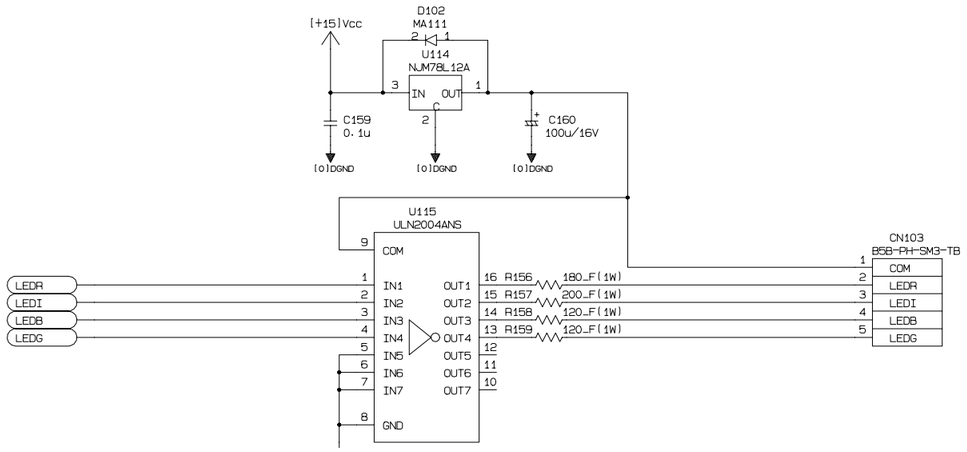
メイン基板　3
Main PCB 3

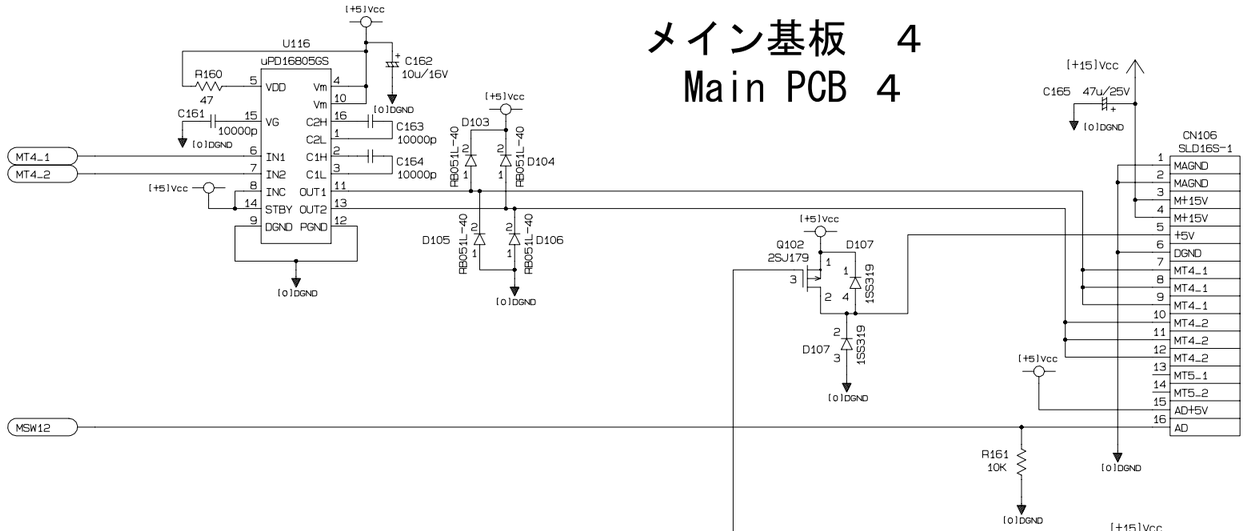


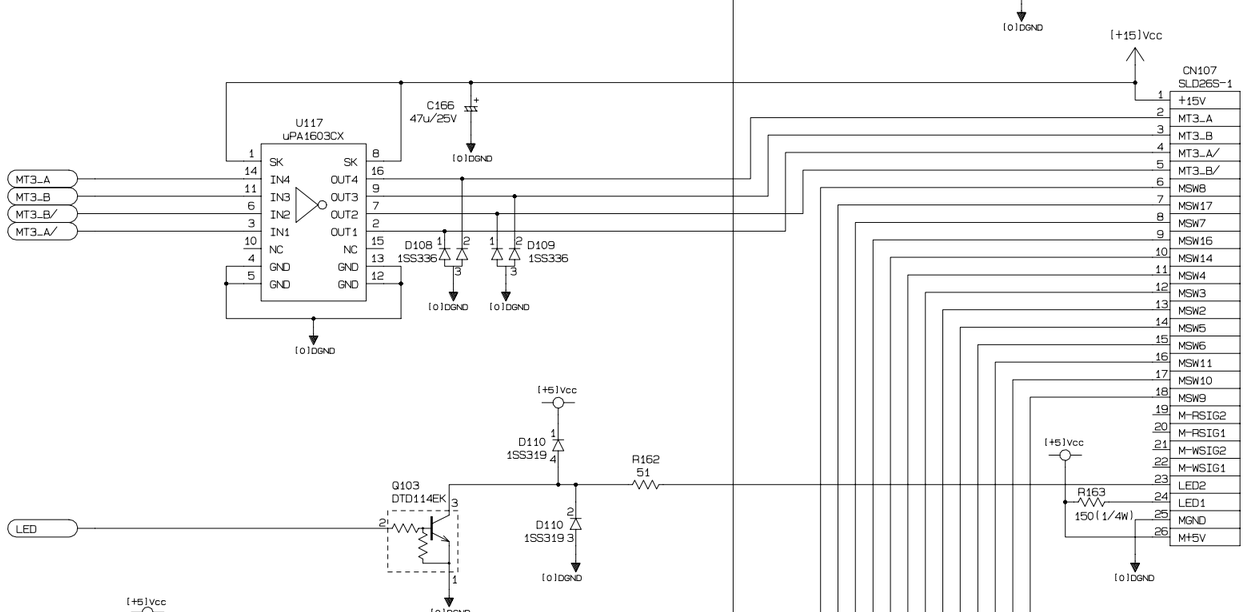
メイン基板　4
Main PCB 4

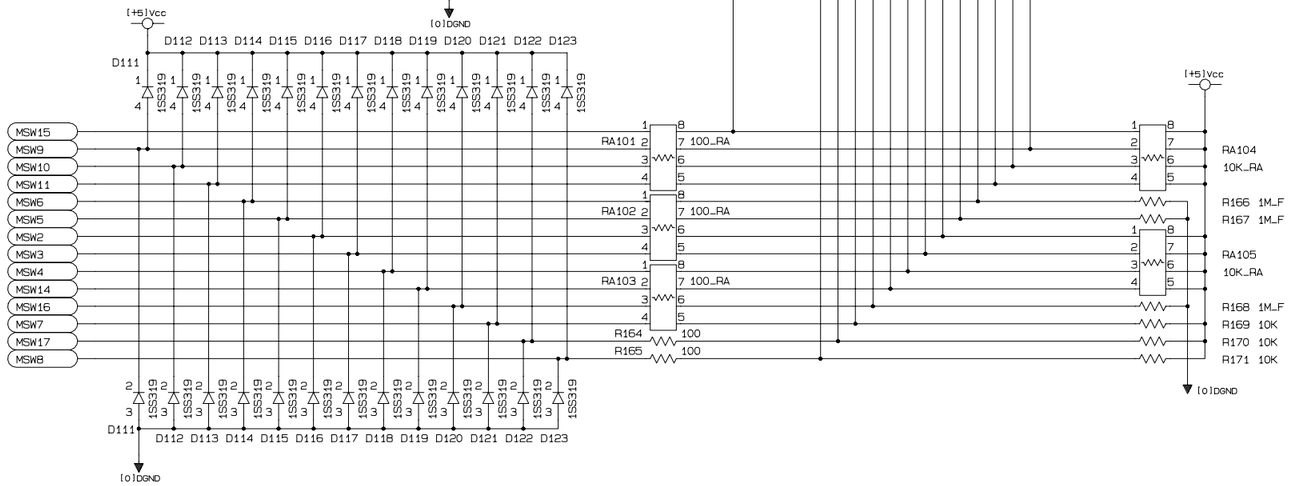




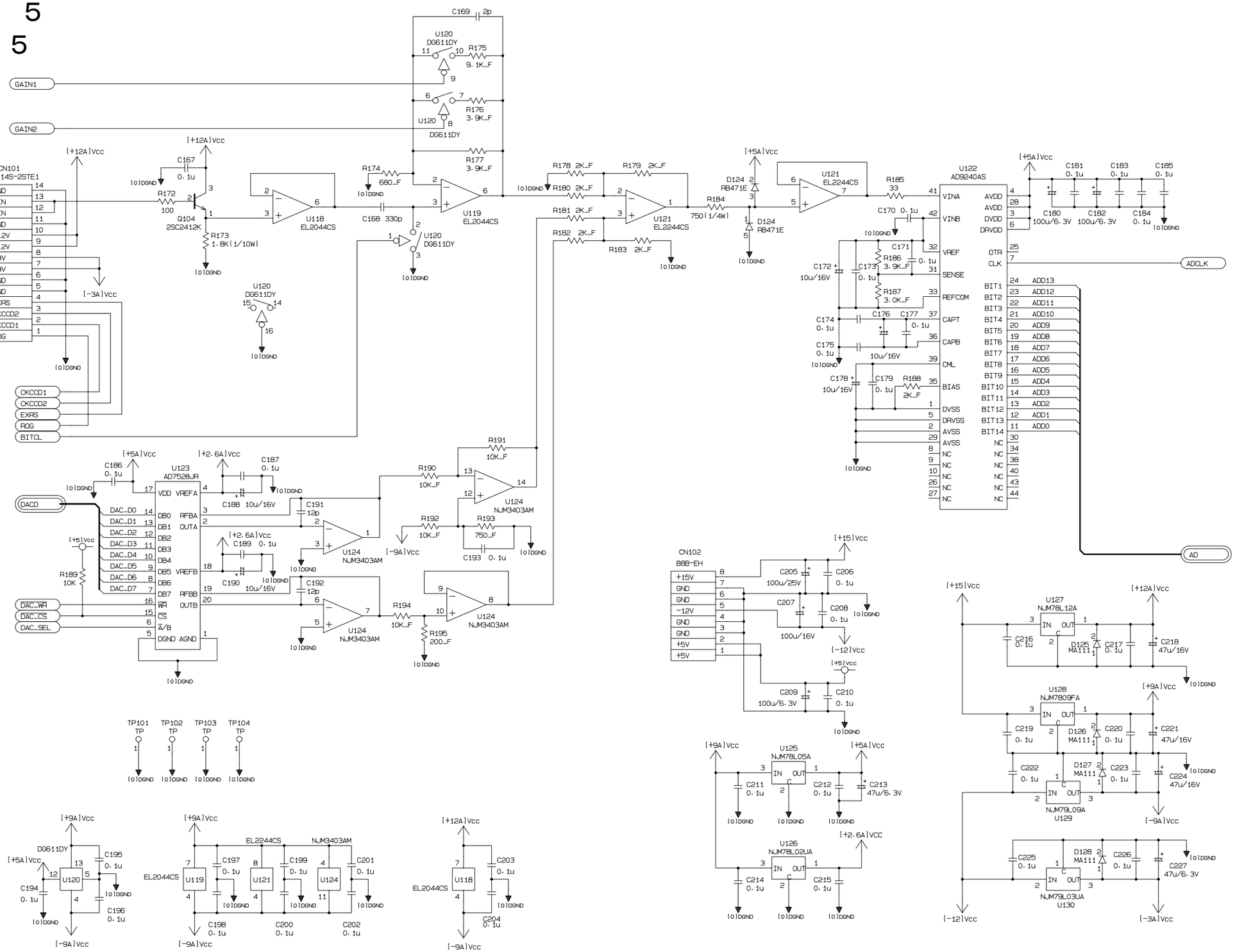








メイン基板　5
Main PCB 5



The contents of inspection standards and tools

[1] Inspection standards ····· Ｒ１～Ｒ６
[2] tools ····· Ｔ１

[1] Inspection Standard

1. Illumination/CCD compensation

・Illumination irregularity:

42% or less for each RGBI (Red, Green, Blue, Infrared light)

・Shading compensation:

Shading value of each RGBI with respect to the outputs should be 10% or less.

・Shading saturation:

Each RGBI should not be saturated.

8 bits: 255 16 bits: 65535

・Adjacent pixels compensation:

Difference in adjacent pixels of each RGBI should be 5% or less

・Uneven brightness in black areas:

48.6 db or more for each RGBI

・Light volume:

The following conditions of WB time for RGBI should be met.

Conditions	WB time
RGBI only	R ＞ 30μs G, B, I ＞ 25μs
Color Positive: 3 colors	R×1.995 ＋ G×1.995 ＋ B×1.995 ＜ 4.366 ms
Color Positive: 4 colors	R×1.995 ＋ G×1.995 ＋ B×1.995 ＋ I×1.122/2 ＜ 8.690 ms
Color Negative: 3 colors	R×1.995 ＋ G×3.981 ＋ B×7.943 ＜ 8.863 ms
Color Negative: 4 colors	R×1.995 ＋ G×3.981 ＋ B×7.943 ＋ WBI×1.175/2 ＜ 13.186 ms

2. AF (Autofocus)

・AF range:

3.7 mm or more

・AF original position accuracy:

Reference value ±32 address or less

・AF alignment position:

AF address ±4 address or less

・AF repeat accuracy:

±4 address or less

・AF time / AF scanning time:

3 sec. or less

3. Scanning

・Scanning misalignment:

Body only (except adapters)

Main scannig direction: ± 0.35 mm or less ・Sub-scanning direction: ± 0.40 mm or less

MA-21

Main scannig direction: ± 0.7 mm or less ・Sub-scanning direction: ± 0.5 mm or less

IA-20(S)

Main scannig direction: ± 0.55 mm or less ・Sub-scanning direction: ± 0.90 mm or less

SA-21

Main scannig direction: ± 0.70 mm or less ・Sub-scanning direction: ± 1.26-mm or less

・Trimming misalignment:

1 pixel or less

・Main scanning magnification:

1.254 times ± 1.83% or less

・Horizontal to vertical ratio (Aspect ratio):

36.87 (Sub)×25.17 (Main) ± 2% or less

・Main/sub-scan perpendicularity:

90° ± 0.35°

・Sub-scan parallelism:

Total area

6 pixels or less within the range of 36.87 mm.

Between adjacent pixels

1 pixel or less for any adjacent pixels in the sub-scanning direction.

Small area

4 pixels or less within any continuous 210 lines in the sub-scanning direction.

・Diagonal line feeding accuracy:

Between adjacent pixels

1 pixel or less for any adjacent pixels in the sub-scanning direction

Small area

4 pixels or less within any continuous 210 lines in the sub-scanning direction

・Repeating accuracy:

1 pixel or less

4. Image quality performance 1

・Total resolving power (MTF):

RGB-color

MTF of 35 lines/mm chart area should be 20% or more

IR-color

MTF of 17.5 line/mm chart area should be 20% or more

・Color registration:

Among RGB

1 pixel or less

IR-color

Scanning misalignment from RGB image should be 4 pixels or less

・Flare:

Data spread in black-and-white boundary areas should be 3.92% (10/255 LSB) or less

・Ghost (image):

Data spread in black areas should be 3.92% (10/255 LSB) or less

・Color reproduction:

Positive film

Average ΔE of 24 patches should be 6 or less

ΔE of each patch should be 12 or less

Negative film

Average ΔE of 24 patches should be 8 or less

ΔE of each patch should be 20 or less; ΔE of No.19-23 should be 15 or less

5. Scanning time

・ Prescan preview time (When Standard PC is used):

Standard Positive film 16 sec. or less

High concentrated film: 120 sec. or less

・Main scanning time (USB2.0）（Same as 8/14 bits):

35-mm Positive 44 sec. or less

35-mm Netative 70 sec. or less

APS Positive 34 sec. or less

APS Negative 55 sec. or less

・Main scanning time (USB1.1）:

35-mm Positive

8 bits: 90 sec. or less

14 bits: 150 sec. or less

・Thumbnail time:

SA-21 30 sec. or less

IA-20(S)

25-frames winding time 19 sec. or less

25-frames thumbnail time 120 sec. or less

40-frames winding time 25 sec. or less

40-frames thumbnail time 200 sec. or less

6. Image quality performance 2

・Negative film reproducible density range

Under conditions of CMS off, γ=1, and 14 bits, output images should be scanned within the range from the min. value is (0) to max. value (16383) of RGB.

・Gradation sequence

The film with up to 2.4 density should be scanned accurately within ±0.1 of the difference between the output density and ideal density.

Indistinctive tone jump

・Density expressible range:
The film with 2.5 - 3.0 density should be scanned within the gradient range.

・Prescan reproducibility
The color variation of 24-patch Lab should be ΔE4 or less. (Reference value: average of 5-times scanning)

・Drift
The average ΔE of 24-patches should be 5 or less; ΔE for every patch should be 10 or less.
The shading standard should be met.

・Streaking
No streaks in both main- and sub-scanning directions.

・Grain roughness
Indistinctive. No significant difference from the traditional models.

・Irregular color
Color difference (ΔE) should be 5 or less.

・Influence of outside light
No influence

7. Operating sounds
No significant abnormal sounds with 55-dB or less at a 1-m distance away.

8. Status indication
BUSY: 0.635Hz ± 1% of blinking frequency
ERROR: 5Hz ± 1% of blinking frequency

9. Force to attach/remove
・Attach adapter:

MA-21	500 ～ 1500 gf
IA-20(S)	500 ～ 5000 gf
SA-21	500 ～ 6000 gf

・Remove adapter:

MA-21	500 ～ 1800 gf
IA-20(S)	500 ～ 5000 gf
SA-21	500 ～ 5000 gf

10. Electric power consumption

AC100V/50・60Hz

0.33A or less

20W or less

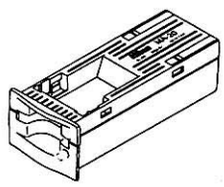
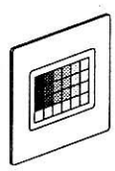
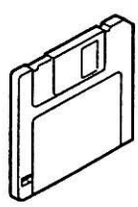
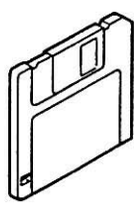
AC240V/50・60Hz

0.22A or less

20W or less

［2］工具一覧表　　Tool List

★：新規工具
★：New tool

	工具番号 Tool No.	名　称 Name	略　図 Illustration	備　考 Remarks
	J67033	グリース(180g) (スミテック３３１　No.1) Grease(180g) (SUMITEC ３３１)		
	J61187	検査用チャート Chart for Inspection		
	J61189	ポジフィルムチャート Chart for Inspection		
★	J65050A	サービス点検用ソフト Windows　(日本語版) Software for Inspection (Japanese)		
★	J65050B	サービス点検用ソフト Windows　(英語版) Software for Inspection (English)		
★	J63088	IR パスフィルター IR pass filter